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How Ripe Olives Are Made

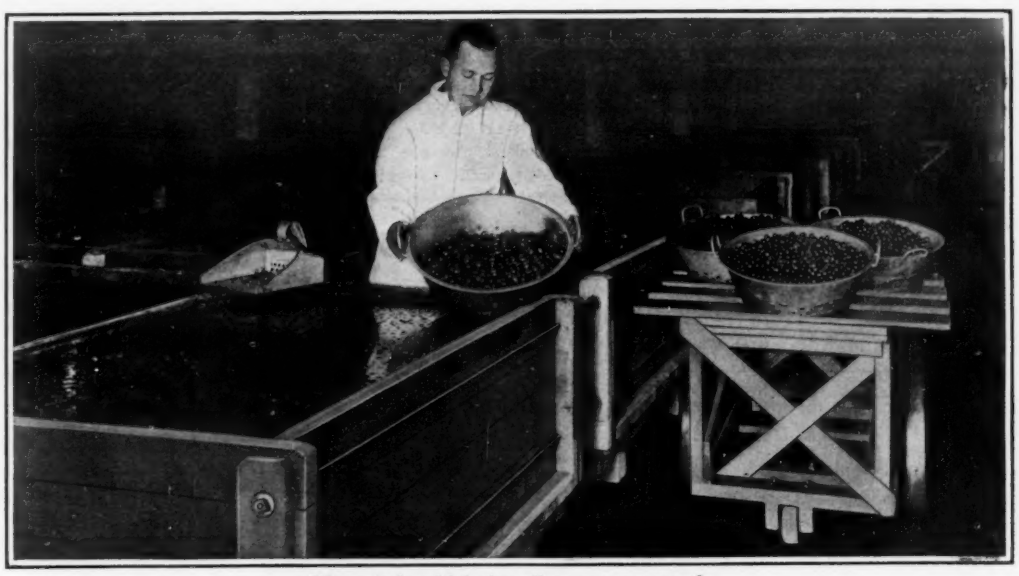
By Arthur L. Dahl

WHEN you eat a ripe peach, or an apple or a cherry, you get the fruit just as Nature made it, and if you pick it off a tree, it will taste all the better. But when you eat a ripe olive, you taste a product that has passed through many a process since it left the tree. True, it looks about as it did when hanging on the branch, but if you should be tempted to taste an olive as it comes from the tree, you would find that quinine is a pleasant flavor in comparison. The olive as made by Nature is endowed with a bitter disposition, a hard, acrid character, and it is only after it has passed through the harrowing experiences designed for it by man, that it is changed into a soft, pleasant and attractive personality. The history of the development of a ripe olive is an examplification of the old adage that "trials and tribulations maketh one sweet."

Let us follow the experiences of a number of olives destined to reach the family table in the guise of ripe olives. The pickling of olives takes from four to six weeks, depending upon the condition of the fruit when received. When the olives are first brought into the factory, they are graded and taken to the appropriate vats. They are first covered for two or three days with a light salt brine, before any lye is used. This is not always done, however, some factories putting the fruit directly into the lye vats when received, but by soaking them in the brine first, better results are obtained.

After remaining in the vats for several days, a light solution of lye (about two per cent) is added, and the olives are kept in this solution for about nine hours. The lye water is then drawn off and the fruit is allowed to stand for 24 hours, after which clear water is added and the olives are stirred by means of compressed air introduced into the tanks. This is continued for six or seven days. Then a second application of a lye solution, not quite so strong, is made to the fruit, and allowed to remain for from six to nine hours. This is then drained off, and clear water is again added, in which the olives remain for another period of six or seven days. If the olives have not attained a sufficiently dark color after the second application of the lye, they are subjected to a third bath, after which they go into a salt brine and are allowed to stand for about ten days.

After the olives are taken from the pickling room they go over sorting belts where women pick out the various sizes and quality of the fruit. These are placed in enameled buckets and are taken to the canning tables where they are placed in the cans, weighed, and placed on endless-belt carriers which take them to the machines where the tops are put on. The cans are stored in the warehouse until they are ready to leave the establishment, when the appropriate labels are pasted on, and the "ripe olives" are ready for the journey to the festive board.



The vats in which ripe olives are processed

Fed in from above, the olives are delivered below by this machine in separate pans, according to their sizes

Pinholes in Photographic Plates

PHOTOGRAPHERS give the name of "pinholes" to the small transparent spots seen upon plates, and in the printing these produce corresponding black spots on the paper. The sizes and shapes of these spots vary according to the causes which produce them, and it is instructive to examine them under a glass in order to note the cause and thus employ the best means for avoiding them. Very small and irregular spots are due to dust which settles on the plate, while circular or elliptical spots are caused by air bubbles in the emulsion or the developer. It is very difficult to avoid the settling of dust upon plates, and especially when traveling, for the dust being suspended in the air, is always ready to fall on the plate even when it is well dusted.

It has been proposed to apply glycerine to the edges of the shutter and to the sliding parts of the plate holder, but this does not appear to be a very practical idea. On the other hand, dust is often produced inside the plate holder itself by the friction of the rough edges of the plate upon the wood frame. The best way to overcome this drawback when the plates have already remained for a long time in the holders is to place the latter in the position which is to be occupied during the exposure and then strike a sharp blow, so as to make most of the dust fall to the bottom, at least the largest grains. Plates which have an anti-halo covering on the back are subject to pinholes because the pigment scales off when rubbed by the spring, for this latter bears upon the opaque layer. A good method is to apply a piece of black paper on the back of the plate to keep the spring out of contact with the pigment. Small round spots are oftenest caused by air bubbles in the developer, and these in turn come from the use of a water supply from a faucet to dilute the concentrated bath. This can be avoided by using boiled water, or at least by allowing the water to stand for a few minutes so that the bubbles can rise to the surface and disappear.

In warm and damp climates it is noticed that plates and especially celluloid film are quite subject to pinholes, and it is a good plan to use a containing box which is kept dry by chloride of calcium. Pinholes can be stopped up by the use of black water color applied in an almost dry state with a very fine brush. Carmine can also be used, but in the semi-transparent parts of the plate it is not recommended to use the various opaque colors, which would replace a transparent point by an opaque point and would not match the tone of the plate, thus giving a white point upon the print instead of a black one. In such places, care should be taken to match the tone, after a few trials in printing. It is a good plan to put colors on with a pen instead of a brush, because the former lays on less color. As to very small spots, these can be neglected, for in the negative the irradiation makes them seem larger than they really are, and they are almost invisible on the prints viewed without a glass.

Soap Substitutes and Clogged Drains

THE shortage of fats in Germany early led to a very stringent shortage of soap. An ingenious remedy was found for this by the manufacture of a soap substitute consisting mainly of fine clay or kaolin manipulated in combination with slacked lime.

An unpleasant consequence of its use, however, is reported in the *Zeitschrift des Vereins deutscher Ingenieurs*. It seems that an uncommonly large number of stoppages in drains and sewer pipes led to an investigation which disclosed the fact that the clogging was due to masses of the aforesaid clay agglomerated with fibrous vegetable debris so as to produce a plugging of the pipes and drains carrying the mixture.

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

Present Status of the U-Boat War

IN response to a widespread demand for more explicit information as to the present status of the U-boat war against merchant shipping, Sir Eric Geddes, First Lord of the Admiralty, recently made a statement in the House of Commons which is unusual in its candor and the amount of detailed information made public.

Sir Eric, a comparatively young man, is a product of the war who has risen to his present high position by virtue of his administrative ability. In this, his first speech in Parliament, he reveals qualities which augur well for the progress of the navy under his leadership.

Too frequently, we had almost said invariably, previous discussions of the U-boat problem have been too narrow in their point of view—have been based upon local and temporary phases of the war. Sir Eric, on the other hand, here gives us a comprehensive view covering the whole of the U-boat operations from the opening of the war to the present day; and it must be confessed that without indulging in any undue optimism the situation must be regarded as highly encouraging.

In the first place, we are told that the failure of the Government to publish the actual tonnage of the ships sunk is based upon well-considered reasons, and that the decision to withhold tonnage figures was reached and is still held on the ground that to publish them would be to give the enemy information which he does not now have and which he would give a great deal to possess: "He would like very much indeed to know what is being sunk regularly, month by month, or week by week, or even exactly for a given period."

In view of the frequent assertions (probably one of the many that are set going by the ever wakeful German propaganda) that the British do not know and have no certain means of knowing what number of U-boats are being sunk, it is gratifying to learn that, "Since the beginning of the war between 40 and 50 per cent of the German submarines operating in the North Sea, the Atlantic and the Arctic Ocean have been sunk." Nor can it be claimed that these sinkings occurred in the earlier phases of the war, when U-boats were small and were operating in confined waters heavily guarded with patrol craft; for the First Lord goes on to say: "During the last quarter, the enemy has lost as many submarines as during the whole of 1916"; which shows that the larger German submarines have been sunk even faster than the smaller craft of an earlier date.

So much for the U-boat losses.

With regard to the victims of the U-boat, we are assured that the German statements are grossly exaggerated. Thus, Germany claimed officially in the month of August the loss of 808,000 tons for all nationalities. Sir Eric tells us that they sunk only a little more than half of that, or let us say, about 420,000 tons for all nationalities. For September, they claimed 679,000 tons; but we are told that they sank far less than one-third of that amount of British tonnage and less than one-third of that amount for all nationalities.

Again, the German claim that the German sinkings of ships is falling because merchant shipping is so depleted as necessarily to reduce the casualties. The reply to this is that in April last, the month of heaviest British losses, British ships presumably sailed the trade routes in sufficient numbers to provide a good bag. Yet, in September last, when the bag was smallest, the overseas sailings of British ships of over 1,600 tons were 20 per cent in number and 30 per cent in tonnage higher than in April. Says Sir Eric: "The enemy must therefore find a better explanation for his lack of success and I can supply it. The explanation is that the long arm of the British navy reached down to the depths (reference doubtless here is made to the depth bomb) with the result that the number of German submarines which do not return, is increasing, and the harvest of British merchant ships is poorer." The maximum sinkings were in April, when nearly fifty ships were sunk in one week. The decline since then has been fairly steady and last week only eight ships of over 1,600 tons were sunk.

Very surprising, in view of the many alarming estimates of losses which have been put forth is the statement: "The total net reduction since the beginning of the war from all causes in British tonnage on the official register, in ships over 1,600 tons is under 2,700,000 tons gross, or 14 per cent of the total. On the other hand, Germany possessed at the outbreak of the war over 5,000,000 tons of shipping; today nearly half of it has been sunk or is in the hands of ourselves or our Allies." As against a reduction of 14 per cent for the British merchant marine, Germany has lost 50 per cent.

In reply to the question whether Great Britain is building merchant tonnage at a sufficient rate to replace sinkings, Sir Eric said that in 1917, when the military and munitions effort was at its maximum, and the call upon man-power had reduced the available resources to a minimum, "We shall produce naval and mercantile shipping practically equal to the best year ever recorded in our history; and in 1918 it will certainly be very much greater." He stated that the output of merchant tonnage for the first nine months of 1917 is 123 per cent higher than the total output for the whole of 1915. Standard vessels have been ordered representing nearly 1,000,000 gross tons, more than half of which are under construction.

We stated in a recent issue that the offensive-defensive methods employed by ourselves and our Allies consist now principally in convoying, which Sir Eric tells us has been very successful. He pays high tribute to the valuable contribution made by the United States Navy in this convoy work. As the result of the joint operations, "In September, 90 per cent of the total vessels sailing the Atlantic trades were convoyed; and, since the convoy system started, the total percentage of loss of convoyed vessels through the danger zone was one in 200."

The First Lord also gave same interesting figures as to the increase in the British Navy during the war. The displacement of the Navy is 71 per cent greater than in 1914, when it was 2,400,000 tons. At the outbreak of the war the Navy included 18 mine sweepers and auxiliary patrols; today there are 3,366. The personnel of the fleet which in 1914 was 146,000 has today reached the huge total of 390,000.

Science and the International Language Question

FROM Europe come reports that the study of Esperanto is popular in the military prison camps, where this artificial language is said to have rendered good service in mitigating the Babel that would normally result from the intimate association of thousands of men belonging to a wide range of nationalities. In this and other ways the war has brought to the front the old and still unsettled question of a universal auxiliary language.

Volapük is almost forgotten; Esperanto, before the war, was on the wane; Ido, Simplo and other recent lingoes in this category have apparently made no serious impression upon the mind of the world. Yet the need of an auxiliary language, a "neutral idiom"—not to displace existing languages or to serve as a vehicle for polite literature, but to meet the requirements of practical intercourse between people of diverse speech—is felt by everybody engaged in such intercourse, and by none more keenly than by scientists and technologists. Consider the present situation as it affects those of English speech.

If we wish to keep abreast of progress in science and technology we must have, at the very least, a good knowledge of French and German and a little knowledge of Italian. It is true that the labor spent in acquiring these languages is richly rewarded in ways unconnected with one's professional work. They enlarge one's outlook on life; make one's thinking more logical by dispelling verbal fallacies and teaching mental short-cuts; unlock a golden treasure of letters. Much of this, however, is pure luxury; and when the typical university attainments in Latin and Greek are added, the cost of the luxury is too great to be borne by the average citizen of a strenuous world. Consequently, a large proportion of our scientists and technologists do *not* get a good knowledge of foreign languages, living or dead; they get a smattering which is often worse than complete ignorance because it leads to eggregious mistakes in translation.

Certainly the progress of science would be much accelerated if the contributors to it in the English-speaking countries, France, Germany, Italy, Russia, Scandinavia, Japan, etc., would make use of a common speech, thoroughly well known to them all. This would be an immense improvement over the present *modus vivendi*, which assumes that everybody knows English, French, and German; in accordance with which we have the Japanese writing poor English, the Russians poor French, the Scandinavians poor German, and the English-speaking world victimized by villainous translations from the two last named tongues.

The artificial languages have not been successful. Esperanto made more progress than any other, but it is now rarely seen in a scientific journal. Some of these manufactured tongues are marvels of ingenuity, but somehow they do not seem to fit the human brain. Natural languages grow up in consequence of complex laws which are only imperfectly known. Apparently these laws are too strong to be set aside in behalf of simplicity and regularity.

The alternative solution of the problem would be to adopt for international use one of the existing natural languages. English is said to be the international language of commerce, but foreigners object to our language, and with ample reason, because its spelling is so bewilderingly at variance with the pronunciation. German has forfeited its chances of becoming the international language of science by its wilful exclusion of Greek and Latin derivatives. French has more nearly attained the position of an international language than any other living tongue, and the war has greatly increased its popularity in the "Ententist" countries; but its primacy is not likely to be accepted, in the near future at least, by Germans and Austrians.

Lastly, much attention is now being given, especially in the scientific journals of Great Britain and Italy, to the proposal to revive the international use of Latin. This was a favorite idea of the late Prof. Guido Bacelli, the distinguished Italian physician, and it has lately been championed in England by Sir Lauder Brunton. The project is being promoted by the Lega Latina, with headquarters in Rome, and by the Royal Lombard Institute of Sciences and Letters, of Milan.

This proposal has much to commend it. Latin flourished as an international language for many centuries after it ceased to be a national one. It proved its ability to adapt its vocabulary to the growth of the arts and sciences.

In some branches of knowledge it still holds its old position as an international medium. The nomenclature of botany and zoölogy is still Latin, and descriptions of new species are supposed to be published in that tongue. It is still used in pharmacy. It is the official language of the Roman Catholic Church, and at least an elementary knowledge of it is still supposed to be possessed by educated people all over the civilized world, except in the Orient. Since it is not the special property of any particular country, its adoption for universal use in all probability would not be opposed by national jealousy.

Last but not least, by furnishing a highly practical *raison d'être* for the general teaching of Latin in our schools and colleges we should perhaps heal the long-standing breach between the "classicist" and "modernist" factions among educators—provided the former could be reconciled to the heresy of putting their idolized darling to work in a practical way.

The prospect is alluring, but it is also delusive. To adapt Latin to the modern needs of science and scholarship is not an impossible undertaking, though the resulting language would make Quintilian turn in his grave.

When, however, an auxiliary language is adopted it must be one which satisfies all international needs, and not merely those of the learned world. We do not want to be burdened with *two* international languages. What would the merchant and the average traveler do with Latin? They would transmogrify it until it ceased to be Latin at all; and even then they would be sadly hampered by the lack of words and expressions that can be produced only by a living "folk speech," spoken in streets, shops and nurseries. We should have a new kind of Pidgin, useful but narrowly limited in its possibilities, and the world would turn with immense relief to the copious and vital vocabularies of France or England.

Notice to Subscribers

OWING to the greatly increased cost of producing the SCIENTIFIC AMERICAN we have been compelled to limit the edition printed each week to the actual number needed to supply our regular subscribers and other customers. It occasionally happens that the stock of some of the issues is exhausted immediately after the date of publication.

Subscriptions for SCIENTIFIC AMERICAN are discontinued promptly at expiration. In order that our subscribers may avoid having any break occur in the sequence of their sets, we suggest that they note the expiration date printed upon the wrapper in which they receive their copies and send in the renewal order at least two weeks prior to that time. This will aid us greatly in rendering prompt service to our subscribers and will also eliminate the possibility of annoyance to them through our inability to supply any of the numbers.

Naval and Military

Insuring Our Supply of Nitrate.—Within the next week or two construction will commence on the new Government nitrate plant. The machinery has been ordered and a site in southwestern Virginia has been selected. As soon as the plant opens, 500 men will be employed and additional labor will be recruited as it is called for. Outside of this source of supply, the Government has made provision for insuring a steady inflow of nitrate from Chile; and it intends to build up a large reserve of this vital raw material. The Federal Shipping Board has authorized a large shipping firm in this city to charter five of the enemy's steamers which were seized when war was declared, and these steamers are to be used exclusively for the shipment of nitrates.

A Long-range Proving Ground.—The Navy Department, according to the *Army and Navy Journal* is asking Congress for an appropriation of $240,000 to purchase 3,157 acres of land at Stump Neck, below the Indian Head Proving Ground; and $157,000 for 1,175 acres adjoining at Cornwallis Neck, for the purpose of moving the armor pits so as to permit an attack at long distance. It is explained, in asking for these appropriations, that the armor pits as they are now placed are in the valley and within five hundred feet of the guns, so there is no room for attacking armor at long range, which is essential. The Department wishes to gain information on the effect of angle fire, the effect of lines of the shells, and to land shells at the maximum range that this property will give them, of 21,000 yards, and then recover the shells to see the fuse action and the action of flight.

Development of Naval Aircraft.—Independently of the Aircraft Act, which appropriated $640,000,000 for military airplanes for use on the Western front, the Secretary of the Navy ordered some time ago the erection of an aircraft factory at the League Island Yard to cost about $1,000,000 and to be completed in a little over three months' time. The plant will employ 2,000 workmen and it is expected to have a capacity of 1,000 of the smaller aeroplanes annually. According to Mr. Daniels, the object of this plant is to enable the Navy to supply a part of its own needs, and to relieve the private plants of experimental work, so that they may bend their efforts to the maximum production of types which have received the approvement of the Government. Already the Department has a flying field at League Island Navy Yard, adjoining the factory, and good facilities for the testing out of hydroaeroplanes.

German Ships as American Transp.rts.—The following is a list of the German ships which have been seized and refitted as army transports for conveying our troops to France. The original German and present American names are given, the latter in parentheses: "Vaterland" ("Leviathan") 54,282 tons, 8,800 officers and men; "George Washington," 25,570 tons, 4,850 officers and men; "Amerika" ("America"), 22,622 tons, 4,500 officers and men; "Cecilie" ("Mt. Vernon"), 19,503 tons, 3,830 officers and men; "Kaiser Wilhelm II" ("Agamemnon"), 19,361 tons, 3,830 officers and men; "President Lincoln," 18,168 tons, 5,200 officers and men; "President Grant," 18,072 tons, 5,200 officers and men; "Cincinnati" ("Covington"), 16,339 tons, 4,000 officers and men; "Grosse Kurfurst" ("Aeolus"), 13,102 tons, 3,175 officers and men; "Barbarossa" ("Mercury"), 10,984 tons, 2,620 officers and men; "Prinzess Irene" ("Pocahontas"), 10,893 tons, 2,540 officers and men; "Friedrich der Grosse" ("Huron"), 10,771 tons, 2,450 officers and men; "Hamburg" ("Powhatan"), 10,531 tons, 2,100 officers and men; "Rhein" ("Susquehanna"), 10,058 tons, 2,000 officers and men; "Neckar" ("Antigone"), 9,835 tons, 2,000 officers and men; "Koenig Wilhelm II" ("Madawasca"), 9,410 tons, 2,200 officers and men.

The British Fleet and the Baltic.—During and since the recent German offensive operations in the Baltic, the question has been asked as to why the powerful British fleet did not enter the Baltic and assist the Russians in their unequal fight against the stronger German fleet. The answer is that it is quite questionable whether any of the larger units of the British fleet would have survived the passage of the narrow straits between Denmark and Sweden, and that if they had they would have found themselves cut off from their base and unable to receive replenishment of ammunition or stores. The straits through which they would have had to force their way are narrow; they lend themselves to mining operations, and, indeed, are known to be heavily mined; the adjacent bays and islands afford good shelter for submarines and destroyers; and last, but most important of all, the passage through the straits is commanded by seacoast batteries of great strength. It was a case of estimating profit and loss; and since the Russian fleet is comparatively small, and upon the British fleet maintaining its integrity depends the winning or losing of the war, it was felt that any effort to force the straits leading into the Baltic would have resulted in infinitely greater loss than gain. Furthermore, an attack of this kind would have involved an infringement of the neutrality of Sweden and Denmark—something which it is the policy of the Allies carefully to avoid.

Science

Synchronous Flashing of Fireflies.—Mr. Frank C. Gates, of Carthage College, reports in *Science* a number of observations which serve to refute the idea sometimes advanced that flashing is likely to occur simultaneously among a number of neighboring fireflies. Besides observing the flashes of fireflies among themselves, the writer attempted to influence the intervals of flashing in individual specimens by the use of a pocket flashlight, but without success. He concludes that "complete synchronism in the flashing of a group of fireflies is simply a very rare accident."

A Radio School for the Merchant Marine has been established at Boston, through the initiative of Radio Inspector Arthur Batcheller, and with the active aid of Mr. W. Butterworth, assistant radio inspector. Several offices and firms have helped in equipping this free school, which was so urgently needed for training wireless operators to serve on America's new fleet of merchant vessels. The classes meet three evenings a week, and there are already 40 pupils. The Secretary of Commerce has visited the school and has officially commended Messrs. Batcheller and Butterworth for their timely and patriotic undertaking.

American Spas and the War.—Dr. Guy Hinsdale has published a paper calling attention to the extensive use made of the European spas in the treatment of wounded and invalid soldiers, and urging that an inventory of American hydrological resources should be taken with a view to putting them to similar uses. In England a committee of the Royal Society of Medicine is charged by the War Office with the task of securing and supervising treatment of soldiers at the English watering places. France is sending her wounded as far as Biarritz and the Riviera. Vichy and Aix-les-Bains are full of soldiers, taking the cure until able to return to duty.

Fecundity in Fowls and Effects on Offspring.—Egg-laying competitions are much in vogue in Australia, in which country the "200-egg" hen (one laying 200 eggs a year) has become commonplace, and will probably be replaced eventually by strains producing 250 eggs or more. Fears have often been expressed that increased egg production would result in degeneration of the constitution of the stock and consequent disaster to the breeder. This subject has been investigated in New South Wales by Mr. A. A. Dunnigliff, Jr., who finds no evidence of loss of stamina in prolific birds. Several cases are cited; among them that of four hens having records of 267, 270, 270 and 288 eggs. After a competition in which they won a world's record they were used for breeding and gave no indication of having suffered constitutionally from the strain of great production. The general conclusion is that a hen is not to be regarded possessor of the faculty of fecundity in a high degree.

The Pink Bollworm in Texas.—Vigorous measures have been taken by the U. S. Department of Agriculture to check the threatened invasion of Texas cotton fields by the pink bollworm. Two of the insects were recently found in a field near Hearne, Tex., where they were introduced in seed imported from Mexico prior to the establishment of the present quarantine by the Federal Horticultural Board. Since the quarantine was established many thousand tons of seed have been turned back to Mexico. A special field force of 12 experts from the Bureau of Entomology has gone to Hearne, where they will coöperate with the state authorities in inspection and clean-up work. Every boll from the seven-acre field in which the pest was discovered has been or will be carefully picked and burned, the stalks pulled up, and all fragments of bolls and seeds collected in a searching examination of the ground. The last step of the process is to cover the ground with oil-soaked straw, which is then burned.

The Weather Bureau in the War.—A large force of physicists, engineers, etc., has been organized under the Signal Corps of the Army for the purpose of taking observations of the upper air with sounding-balloons for the benefit of aviators and artillerists, and conducting various meteorological investigations having a direct bearing on military operations. Dr. W. R. Blair, of the Weather Bureau, who has been commissioned a major and placed in charge of this work, is now in France. He will also have under his direction the work of several new aerological stations which the Weather Bureau is establishing in this country, especially for the benefit of aeronauts, with the aid of an appropriation of $100,000 voted for this purpose at the last session of Congress. The forecasting of the weather at the front for the benefit of the Army has been entrusted to Mr. E. H. Bowie, one of the national forecasters of the Weather Bureau, who has also been commissioned a major and is now in France. A third Weather Bureau official, Mr. H. B. Hersey, who served as a major in the Spanish War, and is a well-known balloonist, has been commissioned a major in the Signal Corps and placed in charge of a balloon school.

Astronomy

John Earle Maxwell, a young English amateur astronomer who will be recalled especially as a warm advocate and exponent of the late Prof. Lowell's views concerning Mars, was killed last March while serving as a sub-lieutenant in the Royal Naval Air Service.

Atmospheric Hydrogen and the Aurora.—In view of the recent measurements of the altitude of the aurora made by Störmer and others, which indicated that the phenomenon was chiefly limited to a region 55 miles and upward above the earth, Camille Flammarion suggests that this location may be related to the fact that the atmosphere at such levels consists mainly or entirely of hydrogen. The auroral discharges would, he thinks, be due to the ionization of this gas by corpuscles emitted by the sun.

Wolf's Comet, 1916. Comet b, 1916 (Wolf) has not realized the hopes that were entertained of it last year. It was discovered nearly fourteen months before its perihelion passage (a "record" for early discovery), and was expected to be visible, probably conspicuously so, to the naked eye during the summer of 1917. This expectation was not fulfilled. On September 17th last it had a stellar nucleus of about magnitude 9.5, a faint diffuse coma, and hardly any tail. A new and very faint comet was discovered by Wolf, at Heidelberg, Sept. 14th. It was originally reported as a return of Encke's comet, but later found to be new. It is, therefore, comet c 1917.

A Valuable Record of Solar Prominences.—At the high-level solar observatory of Kodaikanal, in India, unusually full series of prominence observations have been made, and these already extend over more than a complete 11-year sunspot cycle. Systematic observations of the heights and positions of prominences were begun in February, 1904, and in the following year a spectroheliograph was installed, and daily photographs were taken and compared with the drawings. During the 11-year period ending with 1914 the average number of effective observation days in the year was about 280, and a total of 59,439 prominences were recorded. The observatory has now published this series of observations.

What We See on Jupiter.—In a communication to the British Astronomical Association, Mr. A. Amaftounsky combats the prevalent idea that the visible features of Jupiter consists of clouds, with perhaps glimpses of the real surface of the planet between them. He points out that clouds, no matter of what vapor their drops may consist, should appear luminous when reflecting sunlight. But there are many extensive dark markings on Jupiter, and as the luminous zones never appear to cover over the dark formations they cannot be considered as floating or moving above them; neither can the dark formations, if they are clouds, be the higher, because then they would appear luminous. Mr. Amaftounsky concludes that both kinds of markings are at the same level and represent the real surface of Jupiter, this surface consisting of matter in a state between liquid and viscous. The high albedo of Jupiter, its peculiarities of rotation, its spheroidal form and its relatively small density indicate that its body is neither solid or gaseous; its rapid rotation would dissipate its elements if it were gaseous, and its spheroidal compression is too great for a solid globe. According to this hypothesis, the luminous zones and dark formations would represent currents of liquid or semi-liquid matter in different physical or chemical conditions, and hence reflecting light differently.

A Scale of Star Colors.—A great deal of more or less haphazard information has been published concerning the colors of stars and planets, partly owing to the fact that astronomers have not heretofore made use of color scales such as have been used by naturalists, in determining the tints of flowers, plumage, etc., and also in various arts and industries. The need of such a scale for astronomical purposes was felt by Prof. W. H. Pickering when he undertook to describe the colors of various areas on the surface of Mars, and he has had one prepared by the color department of the University Press, Cambridge, Mass. It is published as a frontispiece of *Popular Astronomy* for August-September, 1917, and Professor Pickering offers to furnish extra copies to anybody who wishes to use it at the telescope. Twelve tints, numbered from 5 to 16, are included in the scale, the colors ranging from deep blue (No. 5) through lighter blues, white, and orange, to deep red (No. 16). Comparisons are made by viewing the planet, or the star thrown out of focus, with one eye at the telescope, and the scale, illuminated by a tungsten light, with the other. As the color of the tungsten light is too yellowish to be used directly, it is transmitted through light blue glass. The illumination of the scale, the aperture of the telescope, and in the case of stars, the focus are so adjusted as to make the celestial object and the scale division of the same brightness, as nearly as can be judged with the eye. Professor Pickering has published a brief list of stars of various spectral types showing their colors on his new scale.

Lake Vessels for the Atlantic Service

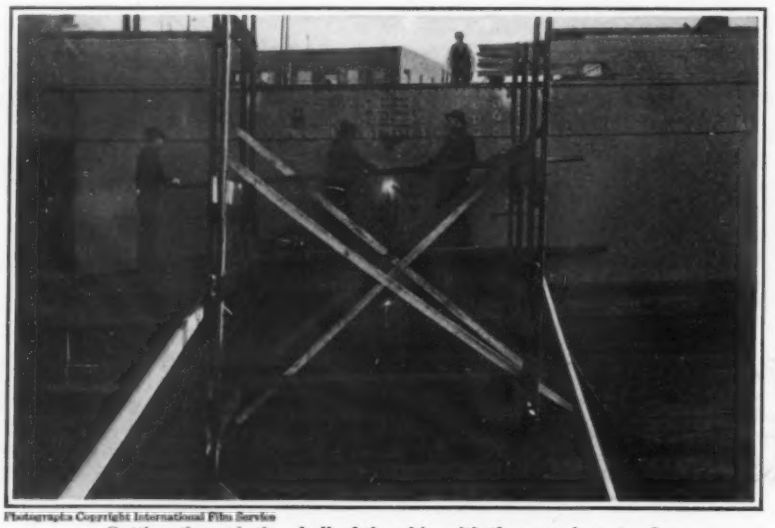
Cutting Them in Half for Shipment Through the Welland Canal to the Seaboard

ONE measure adopted by the Government in its effort to enlarge our trans-Atlantic fleet of merchant ships and transports is to requisition a considerable part of the great fleet of ships which plies on the Great Lakes. Many of these vessels are of great size, rivaling the largest merchant ships in the Atlantic trade. A large number of them are over 500 feet in length, and some have passed the 600 feet limit.

In order to bring these ships to the sea, it is necessary to cut them in half; otherwise they could not be brought through the Welland Canal, the length of whose locks is limited.

The first installment of ships thus requisitioned by the Emergency Fleet Corporation consists of thirteen vessels from 274 to 387 feet in length. Our illustrations show the work of cutting one of these vessels at one of the ship-building yards of the Great Lakes.

This particular ship is the "North Wind," built in 1888. Her dimensions are 300 feet by 41 feet by 21 feet, and her gross tonnage is 2,746 tons. The separation of this ship into two halves is done, either by means of the acetylene torch or by cutting out the rivets at the butts of the plating. In the case of the "North Wind" the ship was placed in dry dock and heavy timber bulkheads were built up on the floor to the top deck, the seams being thoroughly caulked to make a water-tight job. Water was then let into the dock and the two halves pulled apart, each half being approximately 150 feet in length. They were then towed to the Welland Canal and passed separately through the locks, the ship subsequently being put in dry dock and the halves riveted together again.



Photographs Copyright International Film Service

Cutting through the shell of the ship with the acetylene torch

We are all of us more or less familiar with the typical freighter of the Great Lakes, a box-like structure with parallel sides terminating in a bow and stern. Probably they do not possess equal bending strength for ships of the same length as vessels built for the Atlantic service; but if any strengthening is needed it would be practicable to put it in when the ships reach the Atlantic seaboard.

How far the Emergency Ship Corporation intend to go in this venture, we are not aware, but it is certain that a vast tonnage is available if the Government wishes to take it over.

Two Lake Ships in dry dock at Cleveland ready to be cut in two

A Metal of All Work

IT is of course a hopeless task to attempt to chronicle all the metallic alloys that are put upon the market, or to state wherein they differ from one another. Especially is it found that a very large number of aluminum alloys possess metallurgical properties which may in general be summarized as those of lightness, hardness and workability. Occasionally, however, a new material comes along which seems to stand well above the common herd. Such a one is the aluminum compound of French origin which has recently been naturalized in Newark, N. J., by a group of energetic workers.

We say compound advisedly, because the makers, while keeping secret its exact nature, insist that it really is a chemical union, and not an alloy. It contains ninety-odd per cent of aluminum, some three per cent of nickel, and other ingredients, and is a product of the electric furnace.

Its physical properties, vouched for by unimpeachable authorities on both sides of the water, bear out well the manufacturers' slogan that it possesses the strength of steel combined with the hardness of aluminum. White in color, it has a fracture compact and homogeneous, similar to that of the best steel. Its specific gravity is but 10 per cent in excess of that of aluminum; yet it possesses a hardness of 119 Brinnel or of 45 scleroscope, and a tensile strength of 30,000 pounds per square inch in castings, 28,000 to 64,000 in rods and sheets, and over 72,000 in highly tempered rods. Its coefficient of linear expansion is .0000153, as against .0000222 for aluminum and .00001095 to .00001322 for steel.

This very favorable catalogue of properties is supplemented by the claim that the new metal is oxydizable neither by action of air—warm, cold, damp or salty—nor by that of water, fresh or salt. It can be sand cast, flowing unusually well and showing remarkably few flaws in this process, and die cast with or without pressure. It is susceptible to hot or cold forging and annealing. It can be drawn, rolled, stamped hardened by tempering, polished, electroplated and soldered. It resists the action of all acids, hot or cold, except hydrochloric, and of all other reagents except solutions of the caustic alkalies. Finally, its machining qualities are admirable.

While this metal is by no means cheap, selling for a dollar a pound with aluminum at its present price of 60 cents, its excellent characteristics, and the fact that it may be obtained in ingots, castings, plates, rods, wires or tubes, make it available for many purposes. It is recommended for automobile and aircraft parts, high speed bearings and electric conductors, valves of all sorts, and a great variety of other uses. For the present the manufacturers are maintaining their own foundry, and will supply castings to order; but this is only temporary, and due to the exigencies of getting their product introduced.

This is by no means a simple problem. When one goes to an automobile engineer and tells him that one has a remarkable new metal which will do all sorts of things and give better general satisfaction than the materials he is now using, one must be prepared to demonstrate that this is so. And frequently this demonstration cannot be given by supplying the automobile factory with the raw material and letting them cast parts from it; for their foundrymen will apply the technique which is best suited to the metals they have been using, and which may be far from the correct way of handling the new material. Hence it is the policy of the concern which has control of this new metal to supply castings

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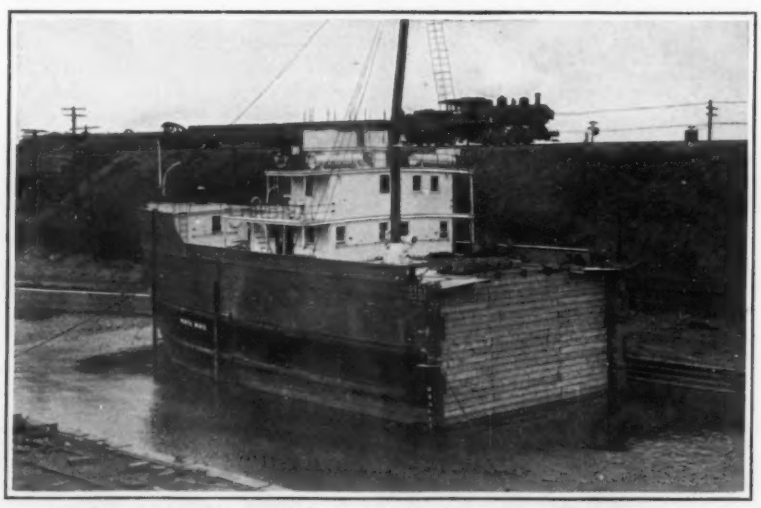
"North Wind" cut in two and and afloat; the halves being pulled apart



The bow of the "North Wind"; the stem section has been towed away

Ships of Stone

Seaworthy Concrete Vessels an Accomplished Fact

By R. G. Skerett

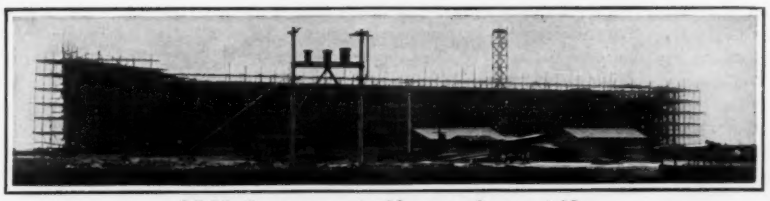
SHORTLY after the shipping situation became acute in this country, and the controversy over wooden and steel craft had about reached its climax, the general public was more or less startled by the suggestion that serviceable vessels of large sizes could be built of concrete. To the layman the idea of a "stone ship" seemed rather preposterous; and while the better informed realized that craft of this material could be made to float, still the opinion prevailed that the walls would be so thick and the hull so heavy that there would be left precious little space for cargo. It seemed to most people more or less like a forlorn hope in the struggle to provide the needed bottoms to offset the ravages of the submarine.

True, barges and pontoons of reinforced concrete were something of a commonplace in some parts of the country, and for a number of years granolithic lighters, having a capacity of from 100 to 500 tons, had proved themselves quite fit and economical in a service that involved the transportation of sand and broken stone in fairly sheltered inland waters. These craft were found to be rugged and to cost comparatively little for their upkeep, but even so they were not self-propelled and were thoroughly unequal to the circumstances of the open sea.

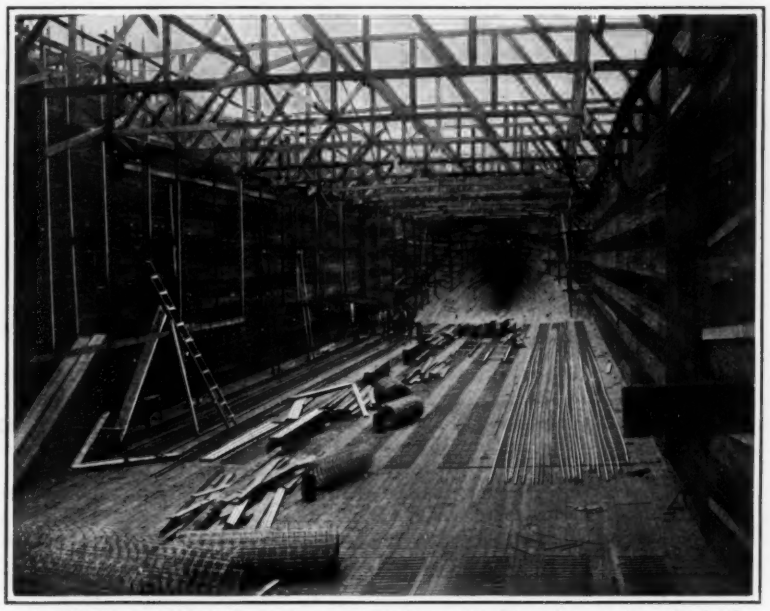
Nevertheless these barges, pontoons and lighters constituted an engineering start upon which to predicate safely the construction of much larger and more ambitious vessels. No wonder, then, when our scarcity of ocean-going bottoms became deplorably short of the demand, that naval architects and engineers familiar with reinforced concrete structures set about planning ships of considerable tonnage of this material for trans-Atlantic traffic. But before we engaged in this revolutionary departure in naval architecture kindred conditions had compelled some of the Scandinavian countries to seek similar relief.

The Norwegians took the lead in this effort, and more than a year ago equipped a plant at Moss, about forty miles south of Christiania. The work at this establishment has been referred to in a general way by our consul at Christiania, but since then much has been achieved that is well worthy of mention in some detail, since through it Norway now has to her credit the first self-propelled, seagoing concrete ship. This craft, the "Namsenfjord," has accomplished a round trip between Christiania and the British Isles which, by the route chosen for safety's sake, involved a total journey of about 2,000 miles.

The "Namsenfjord" is a single-screw vessel driven by a heavy-oil engine of the Diesel type, and her displacement is in the neighborhood of 500 tons. She carries enough fuel for the outbound and the return voyage, and was built especially for service between Norway and England



Molds for a concrete ship, seen from outside



A 5000-ton concrete ship under construction at San Francisco on the standard mold system

It was not long after the outbreak of hostilities in Europe before Norway felt acutely the rapidly growing shortage of structural steel materials, and it was this state of affairs that inspired Nicolay K. Fougener, who had already built some small ferro-concrete craft in the Philippines, to interest his compatriots in the establishment of a yard at Moss. The urgent need of additional bottoms found the public in a receptive mood, and no trouble at all was encountered in getting ample funds for the equipping of a plant having a potential yearly output of from 20,000 to 30,000 tons.

The first vessel undertaken at the yard was started in June of 1916, and by the beginning of 1917 the establishment had built and launched a matter of 15 craft. Most of these were barges for coastwise towing, and it was not until a few weeks ago that the "Namsenfjord" was ready for service. The earlier boats enabled the company to feel its way in perfecting the methods now standardized, and today the yard has on the blocks one ship of 4,000 tons well advanced, and four others begun—three of 1,600 tons and one of 1,000 tons, all of which will be driven by Diesel engines of the Bolinder type.

The same company is also constructing a lightship of reinforced concrete for the Norwegian Government, and when this vessel is ready she will be stationed in the stormy sweep of the Skagerak. The yard is building, besides, a big tugboat of the same material, and has already turned out a granolithic floating drydock having a lifting capacity of 75 tons. Based upon the experience gained in this case, the concern is now about to undertake two other floating docks of ferro-concrete each capable of handling ships of 7,000 tons displacement. These various adaptations of reinforced concrete illustrate the wide range of applicability of this material in the different departments of marine architecture.

The distinctive feature of the Fougener method is the need of a minimum of fabricated steel, and such as is used is in the form of either straight bars or metal lath. This latter is similar to that employed so extensively here in the get-up of many of our reinforced concrete buildings. This means that steel ribs or built-up frames, such as are required in some of the American designs of concrete ships, are not called for in the Fougener system. In short, the very fabricated steel that costs most and is pressingly demanded in the building of all-steel ships has no place in a Fougener craft. The materials required are those that can be readily had and at relatively low cost.

In the building operation the high-priced labor of the steel worker and the riveter is dispensed with, and the concrete finisher is substituted. The latter is not of the so-called skilled labor class, and it is possible to qualify the ordinary worker in a brief while. By means of the clever arrangement of his steel lath, Engineer Fougener is able to form the hull walls of thicknesses ranging from a maximum of only four inches down to thinner sections of but 2½ inches. Not only that, but his hull is a homogeneous body, and the union between his concrete and his embedded metal is perfect. This is in direct contrast with other types of ferro-concrete ship designs, and is bound to emphasize its merit after a period of sea service. If the tie between the concrete and the steel be not a strong and perfect one, the ocean-going stresses will lead to separation, fracture, and serious breaks in the concrete veneer.

Engineer Fougener does not have recourse to molds as the term is ordinarily understood in concrete construction. He forms his metal lath in a double wall and pours his cement in between. Some of the concrete, of course, works through the perforations and takes the shape of knobs upon the two outer surfaces. These knobs form, in turn, the anchorage upon which he lays the coating of the inside and the outside of his vessels. The steel bars that constitute the prime reinforcing feature are, as might be expected, set in place between the

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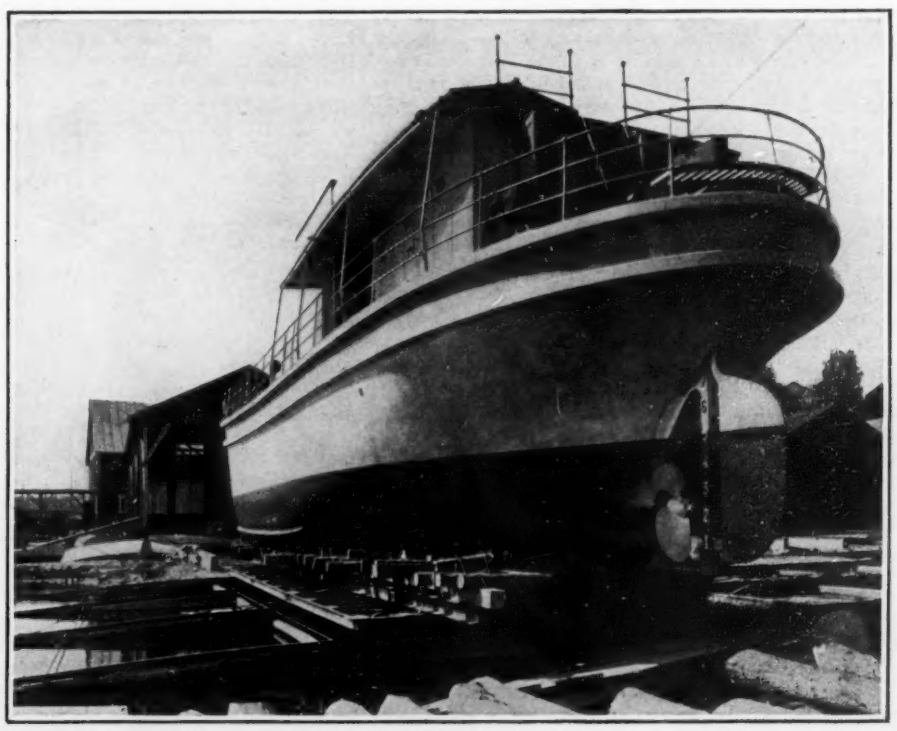


The recently constructed concrete ship "Namsenfjord", which has actually navigated the North Sea

Strategic Moves of the War, November 8th, 1917

By Our Military Expert

THE center of interest of the war has again been transferred from the western to the Italian front where by taking advantage of the bridge heads of Santa Maria and Santa Lucia, which had always remained in their possession, the Austro-German forces broke through the Italian lines on the east bank of the Isonzo and brought the struggle to the right bank of the river. This occurred on October 26th and has led for the Italians to one of the greatest disasters of the war. The blow fell at two points on the Isonzo line—one near Flitsch on the north and the other in the country around Tolmino extending about three miles south of that town. The attack developed into a great offensive; the Italian army was quickly forced back by an enormous concentration of German and Austrian troops and guns, despite their desperate resistance to prevent a hostile entrance upon the level country of eastern Venetia. It is said that 350 Austrian battalions and ten German divisions were concentrated for the attack; if so, that means about 500,000 men under the leadership of three of the most famous German commanders on a battle front of approximately 23 miles. Giving way under terrible pressure, the Italians finally reached a new defensive line behind the Tagliamento River while the Germans, debouching from the hills, closely pursued them following in general the railroads running to the west through Cividale and Udine. Both of these towns were taken. The Italian lines were stretched along the Tagliamento from the Carnic Alps to the sea so that the entire Isonzo line was abandoned by them after the destruction of all bridges.

The Tagliamento lines had been strongly fortified for some years previous to provide against just such an emergency as existed; but it is by no means certain that the Italian commander ever intended to make a stand there; it is more than probable that he contemplated only a delaying action in order that the lines on the Piave 25 miles to the rear could be prepared. The Tagliamento position could be too easily outflanked, especially on the north; with this in view and with a possibility that a wedge could be thrust forward into the center of his lines, he evidently made preparations to withdraw even before the very operations were carried out by the Austro-Germans that he foresaw might take place. A wedge was driven into his lines near Codroipo in the center and at the same time strong pressure was brought to bear on the left flank of his lines to the north and northwest. It therefore became necessary to withdraw not only on the Tagliamento position proper but also to fall back on the north and northwest throughout the mountain regions, from the Fella valley to the borders of the Trentino, on a front of nearly 100 miles. The indications are that a stand will be made on the Piave running south and southeast from the Venetian Alps to the Adriatic; such a position would shorten his defensive front from 75 to 100 miles. The actual line of the Piave gives a much stronger front than the Tagliamento; it is only about 60 miles long, running nearly in a straight line from the mountains to the sea, at which point it is less than 20 miles from Venice.

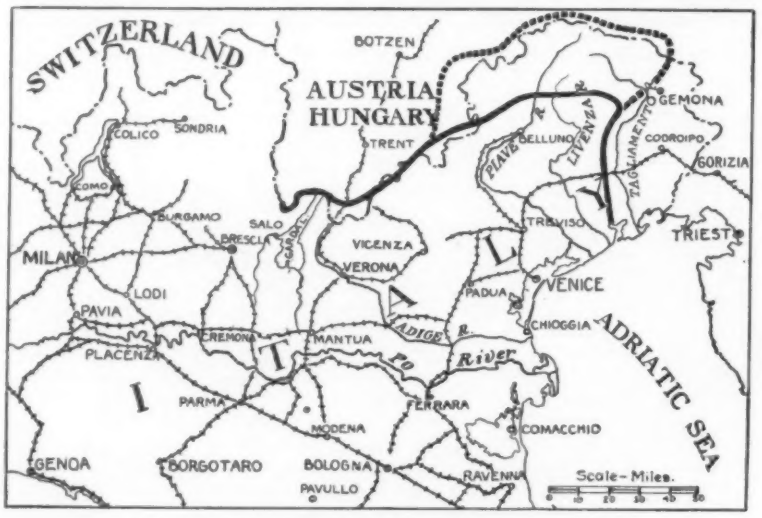
The retreat of the Italian army to the Piave will also give time to bring up the French and British forces that are hastening forward with heavy guns to resist the invasion; the lack of such guns has been one of the most potent causes of the defeat on the Isonzo.

There was a possibility that the Italian commander would halt his troops on the line of the Livenza River that parallels the Piave at a distance of about ten miles. It is approximately 15 miles from the Tagliamento and runs from the Carnic Alps to the sea. The line of this river is shorter and narrower than that of the Piave and offers but few of its natural advantages as a defensive line. However, latest reports say that this has been selected for a new defensive and that the withdrawal to the line has been carried out with covering units or troops on the northern flank and by the regular rear guards on the south. It must be that the Livenza is used only as a delaying action and that there is no expectation of holding the Austro-German forces until the line of the Piave is reached. The latter line has been reported as under preparation for more than a week and it appears that the British and French troops with heavy guns are now ready for action against the enemy along this position.

If once forced from the Piave front, the Italians must retire at least to the Brenta River and must surrender to the Austro-Germans the city of Venice and the greater part of the Venetian province; but undoubtedly this will be done only as a last resort and would occur only after a disastrous defeat on the Piave. Another danger lies in a possibility of a move in strength from the Trentino region on the north. It will be recalled that before this in 1916, the Austrians advanced upon the Asiago and Arsiero plateaus and thus seriously threatened the productive regions of Venetia and the cities of Verona, Vicenza, Padua and Venice in that province. A Teuton army in force cutting across the frontier and down the northern valleys would be directly on the rear of the Italian lines and would cause a hurried withdrawal of the Italian armies to the Adige, Mincio and even perhaps to the historic Po of so many battle memories. Already the Germans are reported as advancing on the Giudicaria front west of Lake Garda. While the Italians state the attack was repulsed, military observers are expecting at many points on the north and to the rear of the present Italian lines, strong German offensives, that may allow a stroke at the rear of the armies on the Piave and elsewhere in Venetia.

If Italian territory must be surrendered in the course of the present military operations, the moral effect would have a tremendous influence in Italy where a pro-German influence has up to the present been pronounced and outspoken in many ways. Whether an actual Teutonic invasion has been the means of rendering this influence powerless by awakening the true spirit of patriotism throughout the country remains to be seen. Reports received here indicate a rising of the people in the face of actual invasion and the strong demand that no peace be made until the enemy is expelled.

While present conditions and the happenings leading up to them can be described only as a disaster, the military status appears to be well controlled and directed despite the confusion and disorganization that must necessarily follow so great a defeat. It should be remembered also that nothing like a counter attack by the Italians can be made until strong British and French reinforcements arrive even if it should be found necessary to give up Venice and the province of Venetia.



The Italian retirement and the menace from the Trentino

Just at present the most crying need of the Italian troops is guns and ammunition to prevent the enemy from following up too closely the retreating armies; the most urgent efforts of France and Great Britain are being made to bring up not only troops but supplies of ammunition before the Germans get the upper hand. In a certain way the blow at Italy may prove of help to the Allies themselves by arousing them to a sense of the desperate situation now before them and bringing greater coöperation among them. They know or should know that the attack upon Italy has not been made merely to score a victory; it was made to save Austria, at the time in dire distress and needing all possible aid. But the Germans had still more in mind; it was hoped that the same disorganization and disintegration that has been produced politically in Russia could also be brought about in Italy where conditions have been known to be bad for some time past. But everything points to the fact that the opposite effect has been brought about. Political animosities have been forgotten, German sympathizers have been quieted, and the nation has arisen as one man against the enemy.

From the military point of view, there are three solutions of the problem that confronts Italy; first, the Italians can make a stand behind one of the rivers of Venetia, such as the Piave, where they will make the strongest resistance possible. The Piave, running from the Carnic Alps to the sea, where fighting is now or soon will be in progress, may become the Marne of the campaign; for the Italian commander expresses great faith in his troops. Second, the Allies may send large bodies of troops and numbers of guns to Italy's aid. The attacking troops now facing the Italians in Venetia probably number more than 50 divisions, and the formidable concentration of their troops still continues. Of course, the Allied troops cannot be as effective as they would be, had time been given for them to become familiar with the ground over which they are to fight. Third, one great battle might be attempted, on their own front, and a strong counter attack could be made on another. The latter would have to be in great force to make its success have any effect in Germany over the advantage that the present drive against Italy has given the Central Allies. All discussions just now on possible results must be purely technical, and based on little knowledge of true conditions.

Reviewing all these possibilities, it must be recalled that after Joffre retreated from Belgium and almost to the gates of Paris, before he was able to concentrate his strength, the victory of the Marne was the result of both his strategy and his sagacity. Perhaps the Italian commander may have something of the same plan in view. If so, it can be expected that the retreat will continue until an offensive can be undertaken, with the aid of British and French reinforcements and guns that are now being hurried forward to halt the Teuton advance. The Entente Allies evidently realize the desperate condition of affairs since it is said that General Foch and the English Chief of Staff are both in Italy to aid actively in preparation to stem the Austro-German rush. It will be recalled that the French General Foch gained the first successes in 1914 at the time of the German rush toward Paris and did so much to repulse the Teuton drive at the battle of the Marne. In those dark days France was being put to the test and has triumphed; today she is moving on to final victory. Today Italy is having the same experience and it remains to be seen how she will bear her trials. If her people rise in their strength and rally, the defeat on the Isonzo may prove a blessing in disguise in bringing about the national unity for the future that has been lacking in the half century which has elapsed since she became one of the European powers.

The long expected retreat of the Germans from the Chemin-des-Dames on the Aisne front took place during the past week when a retirement along a front of 15 miles was made to the north bank of the Aillette River. Here they were thrown back at least a mile; their positions on the south bank were exposed constantly to an enfilading fire from the French guns that rendered it impossible to keep their front supplied with ammunition and food because every movement, while crossing the Aillette valley, could be observed by the French from the latter's commanding position. On the Aisne front Laon is undoubtedly the primary objective and the French are rapidly approaching it. Everything points to a retirement of the Germans from Belgium when spring comes. Not only have they withdrawn on the Aisne front but they are reported as dismantling and destroying factories and workshops in Belgium, and as shipping all machinery into Germany.

It is certainly not improbable that the present retirement is the beginning of such a withdrawal. Having lost the commanding positions of the Chemin-des-Dames, there is no particularly high ground suitable for defensive positions until the Meuse is reached; this would require a general drawing in at other places, so that, unless such moves take place all the way to the sea, there would be a dangerous salient in the German lines that could be easily crushed by the English and the French.

On the English front little has occurred for some time recently except lively artillery fire and trench raids. But on the morning of the 6th the Canadians by a quick rush seized the village of Paschaendale northeast of Ypres, which dominates the plain of Roulers; they advanced about half a mile beyond and are reported as holding their positions. With their occupation of the village the British now hold the crest of Paschaendale ridge; beyond this, the plains and dunes of Flanders extend to the sea at Ostend and Zeebrugge, the German submarine bases.

It is also probable that, besides extending operations in the direction of these places, the British Commander will continue to reach out in the direction of the railway center—Roulers—now only six miles away. Along the Yser lowlands the Belgians have been particularly active and are proving their worth against the enemy. The Germans are being slowly but surely driven out of this sector on which their seacoast line hinges; all of this will render easier the future British operations to oust the Germans out of their bases on the North Sea.

The "Trading with the Enemy Act"

Conditions Under Which Patents of Enemy Subjects May be Used

NO unprejudiced person can read the provisions of the "Trading with the Enemy Act," which was approved by Congress on October 6th, without realizing its absolute fairness and respect for the rights of the individual. In this, as in other wars, we have declared emphatically that we were not fighting the people but the Government of the opposing nation; that we were absolutely opposed to confiscation of private property, and would resort to the use of such property only when compelled to by circumstances affecting the safety of the nation.

When the United States declared war upon Germany it became an act of treason for any citizen of this country to trade with the enemy. However, there were certain classes of trade which could not be severed without serious consequences to our own people. It was to remedy such conditions that the "Trading with the Enemy Act" was enacted by Congress. The most important provisions of the Act are those which have to do with the prosecution of patents here and abroad and the use of foreign patents by American citizens. The Act makes it possible for an enemy or ally of enemy to file an application for patent or for registration of trade-mark, print, label or copyright in this country. Should he be unable during the war or within six months thereafter to file his application on account of conditions arising from the war, or to pay any official fee or to take any action required by the law within the period prescribed by the law, he may be granted an extension of nine months provided the nation of which he is a citizen or subject, shall extend similar privileges to citizens of the United States.

Again our citizens are not to be deprived of the right of prosecuting or protecting their patents in enemy countries. Any citizen when duly authorized by the President may pay to an enemy or ally of enemy, any tax, annuity or fee required by the laws of that country in relation to patents, trade-marks, copyrights, etc. Such trading with the enemy is conceivably permissible provided it is properly regulated. It will be clearly evident, however, that an enemy sympathizer might use this provision to introduce large sums of money into the enemy country. Hence the Act stipulates that such dealings with the enemy can only be carried on, on application to the President, and that the maximum amount of money sent in each case shall be subject to control of the President.

The President has vested power in the Federal Trade Commission to issue or withhold licenses. The administration of the law will be under the immediate supervision of Commissioner Fort, formerly Governor of New Jersey. The Commission has designated Charles H. McDonald as counsel in charge assisted by Edward S. Rogers and Francis M. Phelps, expert legal advisers.

A further provision of the Act makes it possible to withhold the grant of letters patent on any invention until after the war, when the disclosures of such invention may be of value to the enemy or detrimental to the interests of military or naval forces of the United States.

Undoubtedly, one of the most important provisions of the Act is that which enables American citizens to avail themselves of United States patents owned by enemy subjects. The war has cut us off from the use of many imported chemical products, chiefly dyes and drugs. Our own manufacturers are prevented from making them, by enemy-owned patents, while our importers are naturally unable to obtain them from the enemy. The statute requires, first, that the patent in which the license is sought, be owned or controlled by an enemy or enemy ally; second, that the applicant must be an American citizen, corporation or otherwise; third, that it is to the public welfare that the license be granted; fourth, that the applicant is able to make the article, and intends to do so in good faith. The rest is left to the Federal Trade Commission. The licensee must file a full statement of the extent of the use of the license and of the prices received, and at stated intervals must pay to the alien property custodian not more than five per cent of the gross sums received by his use of the invention. After the end of the war the owner of the patent may file a bill of equity against the licensee for the recovery of the license and the Court in due proceedings may decree to the owner payment of a reasonable royalty, this payment to be made from funds deposited by the licensee, and if, after the payment of the judgment there remains any balance, it shall be repaid to the licensee on the order of the alien property custodian.

Our Government has been very liberal to inventors. It has sought in every way to advance science and knowledge. The United States is one of the few countries that is willing to give a patent to an inventor without requiring him to operate his invention within the country. Furthermore, we are very liberal in our manner of granting patents. A patent is supposed to be granted to an inventor as a reward for advancing public information. An inventor is supposed to make a complete exposition of his invention so that the public may reap the benefits of it, and, as a reward for this disclosure, he is given a monopoly for a period of 17 years. However, there is a defect in our system which requires merely that the inventor disclose a workable process or machine and not necessarily a commercially practical one. German inventors have been quick to take advantage of this defect, particularly in the patenting of chemical processes. They draw a distinction between "process" and "technique." As long as our statutes require merely that the process be disclosed the German inventor will make a disclosure of his chemical processes to an extent just sufficient to come within our requirements, but will withhold, as trade secrets, many steps in the process which are essential to a commercial exploitation of the invention. Our statutes, furthermore, permit an inventor to patent separate steps in a process, and this the German inventor frequently does thereby covering certain vital parts of his process which afford him absolute protection without disclosing the intermediate steps which are necessary to a full knowledge of the process of manufacture.

The German Government, on the other hand, insist upon a complete disclosure. The following abstract of the requirements in this respect, of the German law, furnished by Brandon Bros. shows how fully the applicant of a chemical patent in Germany must explain his process of manufacture:

"German applications for new processes for the manufacture of chemical preparations must be accompanied by a sample of these preparations, and also of the compounds used in the process, so far as such compounds may be new. These samples, which should weigh about 8 to 10 grams (4, 5 to 5, 6 avoirdupois drams), should be put up in glass bottles of about 30 millimeters (1.18 inch) diameter and 80 millimeters (3.15 inch) entire

(Concluded on page 369)

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

The Rail-Testing Machine

To the Editor of the SCIENTIFIC AMERICAN:

In the SCIENTIFIC AMERICAN of June 23d, 1917, you have an article on "Why Railroad Rails Wear Out," or subject very similar to this. Upon reading the article I was very much surprised to find that the machine described is one I personally designed and had made for the Nebraska State Railway Commission in the *University of Nebraska shops* last winter. In the article, credit is given to *Missouri University* which is an error. Further the article states that the motor is from a worn-out phonograph and that the paper upon which the records were taken was brown paper. The description of the machine was anything but complimentary in tone.

As a matter of fact the motor was from a phonograph originally, but for a number of years was used on experimental laboratory apparatus because of its extreme regularity of movement. It was therefore the best instrument for the purpose that could be found. Also, the paper was not brown paper as stated, but regular record paper cut and stamped for the occasion. I am pleased to say that the completed machine gave some remarkable curve records on tests. These curves are exerting considerable weight as evidence in the court trials now in effect between the Nebraska State Railway Commission and the Missouri Pacific Railway. If you should see fit to make an additional statement in the SCIENTIFIC AMERICAN, according with the above facts, I would be very grateful.

J. D. HOFFMAN.

Lincoln, Nebraska.

Tagging the Submarine

To the Editor of the SCIENTIFIC AMERICAN:

On page 11 of your July 7th issue, appears an article describing a Tell-Tale Net to be used in tagging U-boats. I am somewhat late in writing, but when reading the article it occurred to me that some improvement might be suggested in connection with this device.

First, in order to be effective, these nets should hang at right angles to the general direction the U-boats are expected to travel, but this would not be the case the way you have described the device, unless the wind conditions were just right. Owing to the excess friction of the net, when a wind is blowing the float would precede the net in drifting through the water, and it is safe to say that all the nets would hang parallel with the direction of the wind. If the submarine is also traveling parallel with the wind there would be little likelihood of its becoming entangled in the nets. It may be assumed that the wind has a prevailing direction, and also the submarines, and for this reason the line from the float should be attached to the net by an adjustable bridle which would permit of the nets to be hung at any desired angle, or at various angles, if the course of the U-boat cannot be anticipated.

Second, the whole device would have to be as inconspicuous as possible, and on this account, after the net has tagged a submarine, the float would not be visible to the subchasers unless they are fairly close to it, and even then, not at all at night. It seems to me that it would be of great advantage to incorporate in the float a large oil torch that would emit black smoke and flame and which would be visible at a considerable distance at night or day, and which would be ignited by a simple contrivance released by the action of the float being towed through the water in excess of a given speed. The torch could comprise of a fuel tank and smoke stack (say 3 or 4 feet long) that would nominally lie horizontal, but would rise perpendicular when released. The torch would not, of course, be lighted until this position had been attained. Or, if desired, a small balloon might be released from the float and towed along behind it. The release mechanism would momentarily cause a slight drag on the submarine, but not enough to be noticable, and would cease when it had done its work.

Third: Would it not be advisable to use a light wire core in the ¼-inch netting, to guard against the net cutters with which the U-boats are equipped?

These defects would undoubtedly develop under actual working conditions, and should be overcome, if practical use is to be made of your device.

C. H. WOODWARD.

San Diego, Cal.

185,000 Horse-Power

To the Editor of the SCIENTIFIC AMERICAN:

Your paper contained a description of an installation of Electric drive on a large warship. Horse-power to be realized, 185,000. It is almost impossible to grasp such an enormous power assembled on a ship. It occurred to me to make two comparisons, so as to make the statement more impressive.

Suppose the ship were to be pulled along, actually by horses, how long a string would there be? Allowing 10 feet in length for each team of two abreast, this 10 feet giving room for harness and "room to kick" the 185,000 multiplied by 10 and divided by two gives us the result, namely *925,000.* Some length!

Another comparison. We know that one horse may lift 33,000 pounds one foot high in one minute. Then 185,000 times that gives us 3,000,000 tons. In our Pittsburgh vein of soft coal there are 7,000 tons to each acre. In 3,000,000 tons, we would have 429 acres. If the veins are 120 below the surface, it would take two hours to lift to the surface, and in 10 hours there will be lifted sufficient coal to exhaust over two thousand acre each day.

Perhaps others of your readers may have interesting comparisons.

JOHN Q. EVERSON.

Pittsburgh, Pa.

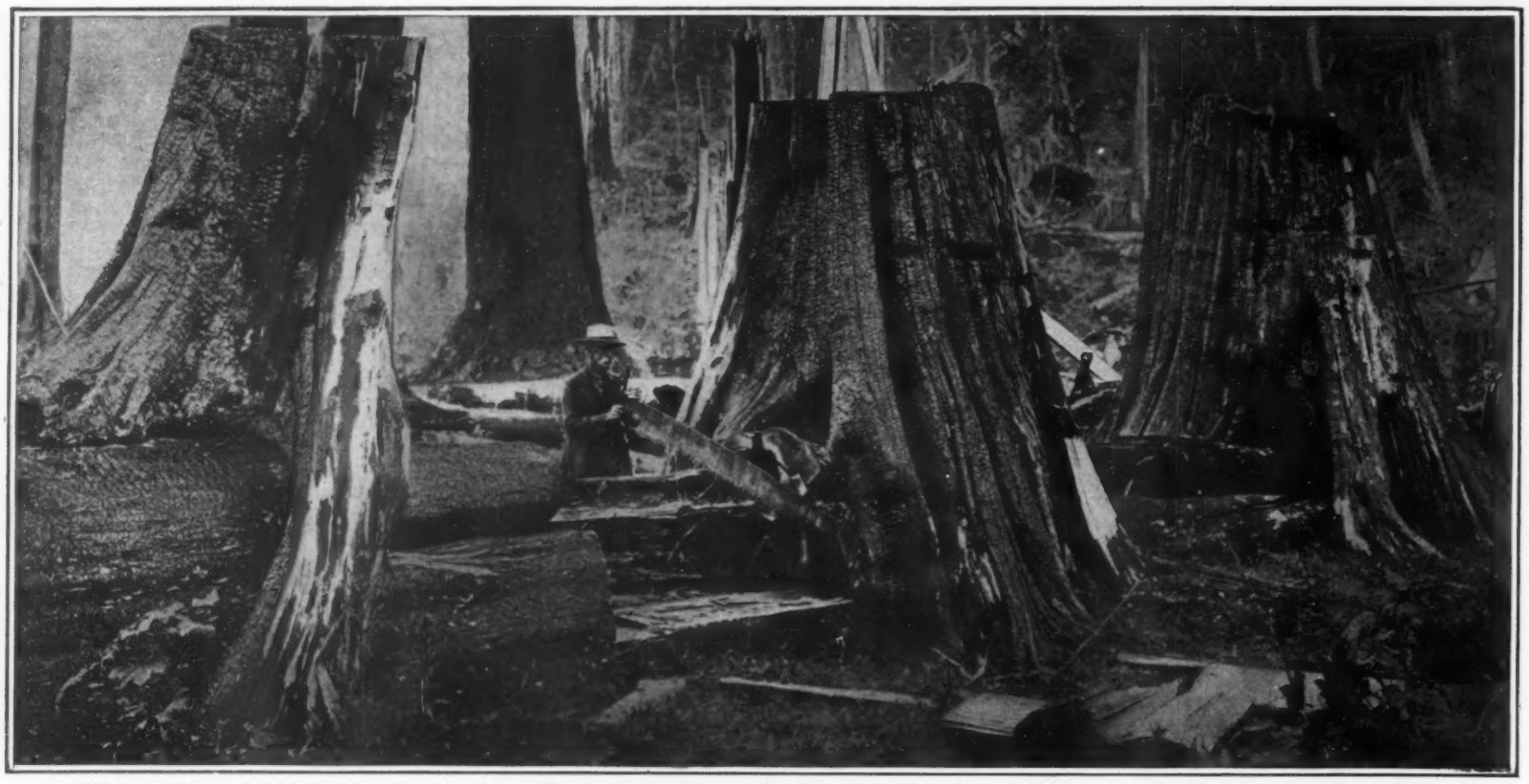
Trench Mortars Against U-Boats

To the Editor of the SCIENTIFIC AMERICAN:

I have noted in reference to the submarine warfare that the U-boats often come to the surface quite near the ships they attack, knowing that the guns on the ships cannot be depressed sufficiently to train on them, and that by the time the ship is able to get into a position to do so, provided it is still afloat, the U-boat has safely submerged. It seems to me that here is an opportunity to use a trench mortar which would throw large shells or torpedoes a short distance. The shells could be set to explode at a certain depth under the water, using the pressure of the water to set off the charge, as is used in torpedoes to regulate their depth under water. Or a torpedo-like shell could be fitted with a propellor which the water would revolve a certain number of times to explode same, it being set free as the torpedo-shell strikes the water. A large high explosive shell dropped at an angle of 45 degrees near a submerging U-boat, exploding twenty to thirty feet under the water, would certainly get the enemy.

ROBERT W. BRUCE.

173 West 12th Street,
New York, N. Y.



This huge fallen tree had lain here for 1500 years, while seedlings took root on its exposed surface and grew into giants of the forest; yet, when the loggers came upon it, it was still sound timber, and was cut up into shingles just like any other log

A graphic demonstration of cedar's resistance to decay

Cutting Logs Into Shingles

How Big Trees Are Converted Into the Thin Slabs That Cover Our Roofs

By Ernest Elva Weir

THE manufacture of shingles is one of the great industries of the country and a most important branch of the lumber business. Although the machines used are neither numerous nor especially complex, the conversion of forest giants into relatively humble shingles is of more than passing interest.

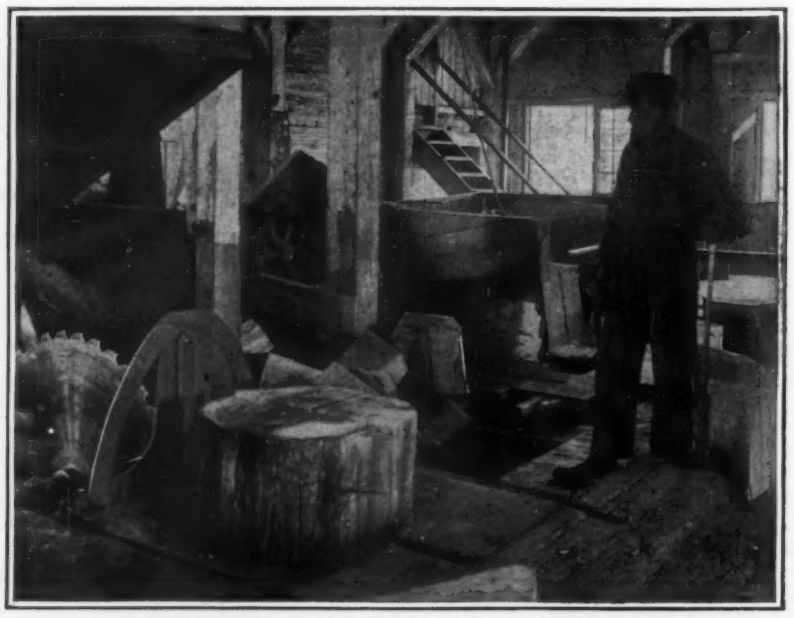
Power to resist decay through constant exposure to weather conditions is the quality most highly prized in a shingle, and it has been found that cedar, redwood and cypress best meet this requirement. This limitation places the largest shingle mills on the Pacific Coast and in the extreme Southern States. The Puget Sound country may safely be rated as the stronghold of the cedar, Central and Northern California (Del Norte, Humboldt and Mendocino counties) as the home of the redwood, and Louisiana and adjacent States as the locality where the cypress best thrives. While the relative merits of the three woods is foreign to the purpose of this article, wide publicity is given to the claim that red cedar has no equal for durability—in fact, that it never rots. Be that as it may, houses built of cedar in 1811 in Astoria, Ore., are as good today as when erected; the cedar planks and shingles on other settlement buildings established by the Hudson Bay Company in 1833 are equal to new, and a visit to Tatoosh Island discloses cedar houses made by the Indians with stone axes.

But with the aid of one of our photographs we may go back into really ancient history. This picture shows the stumps of three cedar trees straddling a fourth cedar lying on the ground. Judging by the age of the largest of the standing trees, the fallen tree had lain there about 1,500 years. This conclusion was reached from the fact that the largest standing tree was 10½ feet in diameter and showed an average of 23 rings to the inch. Furthermore, this fallen tree was found by the woodsmen to be thoroughly sound and well-preserved, and it was used not so long ago for the manufacture of shingles.

Lumber intended for shingles is usually delivered to the mill in the log, either by the rail or water route. After traveling up the slip to the mill, the log is cut into blocks the same length as the shingles to be manufactured. In the case of very large logs, this is done with a drag saw, but a circular saw is used for trees of less unwieldy dimensions. The blocks are then cut into workable units (bolts) with an axe, a knee bolter or an automatic power bolter. Mills of small capacity and handling small logs use a knee machine or an axe, but the more important plants find it advantageous to employ the large power machine almost exclusively. The essential feature of a knee bolter is a small horizontal carriage that may be moved in and out of the path of a rapidly revolving circular saw. The machine receives its name from the fact that the workman pushes the blocks against the saw by knee pressure exerted on the carriage. All bark, sapwood and knots are removed by changing the position of the block after each contact with the saw. In a power bolter, the carriage automatically feeds the blocks against the saw, and on the return of the carriage, the block is turned and again fed against the cutting edge. With either style of bolter, the blocks are divided into four or more smaller ones.

It must be remembered that a shingle is a tapered piece of wood varying in length and width. However, 16 or 18 inches long and four inches wide are considered standard measurements, and are used as a selling basis. The standard thickness of shingles is either two-fifths or one-third of an inch for the butt (or thick) end, and one-sixteenth or three-thirty-seconds of an inch for the tip or feather (thin) end. Shingles are evenly tapered throughout their entire length. The best grades are cut with an edge or vertical grade—that is, a grain running edgewise of the shingle; other grades are cut with what is known as a slash grain—that is, a grain running diagonally across the shingle. The disad-

The first step—cutting the logs into rough blocks



The second stage—reducing the blocks to workable size

The early phases of the passage from logs to shingles

vantage of the latter is that the coarseness of the grain is exposed to the weather and causes the shingle to "cup" or buckle.

The workable units are cut into the finished product on shingle machines; these are of various types. One type holds the block firmly in an upright position with grips above and below, and is provided with ratchets so adjusted that the top and bottom of the block are alternately pushed forward in the path of a vertical circular saw. This alternate movement of the block occurs after each cut of the saw and is what gives the shingle its taper. As the saw comes in contact with the *side* of the block, it will readily be understood that the butt and feather ends of the shingle are cut at the same time, and also that the butt and feather ends are alternately at the top and bottom of the block. Incidentally, it might here be mentioned that by adjusting the teeth of the ratchets, the machine may be made available for cutting box shooks. In this case, of course, the block is pushed forward an even distance at top and bottom, thus cutting off strips of the same thickness at both ends.

Another type of shingle cutter has a horizontal saw mounted on the top of a vertical shaft driven from below. With this machine, the bolt is fed in a horizontal position on either a hand or an automatic carriage. These horizontal machines are frequently made with a double-end carriage so that two blocks may be operated on opposite sides of the saw. Under this arrangement, a shingle is cut first from one block and then from the other as the carriage travels over the saw.

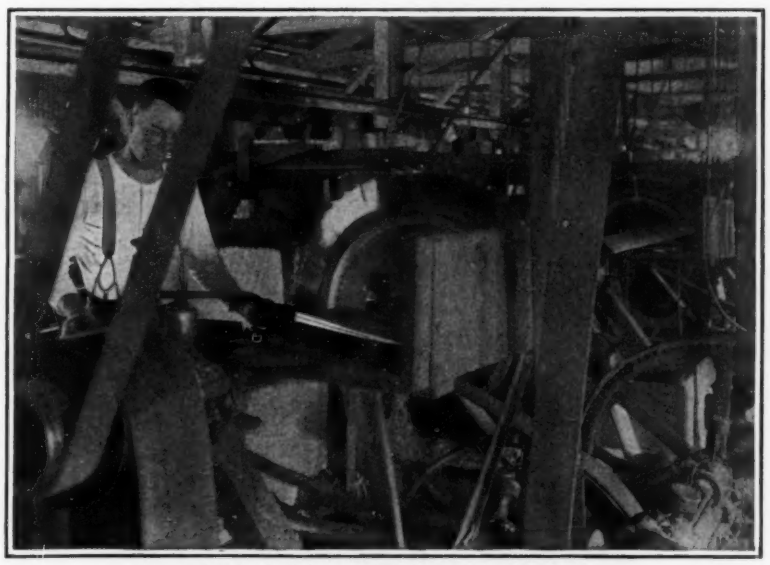
Other and still larger machines have a rotary carriage traveling in a direction opposite to the cut of the saw. This rotary carriage has compartments for sometimes as many as ten blocks, which gives almost a continuous cut on the saw. Needless to say that the saws on these machines are much larger in diameter than is necessary for the smaller types.

Before dropping the shingles down a chute to the packing room, the workman places each one on a spring rest, pushes it against a smaller saw, clips off any defects, straightens the edges and makes the shingle slightly narrower at the thin end. This trimming saw is called a jointer and is an integral part of the shingle machine.

Shingles are packed in bundles of either 200 or 250, and are so marketed. Water freights are figured on the basis of so much per 1,000 shingles, and 1,000 shingles equals 100 feet of lumber.

When shingles are to be shipped long distances by rail at high freight rates, they are first kiln dried; this, of course, reduces the weight. They are kept in the dry kiln for a week or 10 days, and those who favor this after-treatment claim that it not only seasons the shingle, but kills any possible infection from fungi. The best results are said to be obtained by admitting live steam into the kiln and maintaining the proper temperature until the shingles are heated clear through. So far, of course, no drying will have taken place. The moisture content of the air is then gradually decreased and the shingles dry from the center outward.

Trimming the bark and knots from the working blocks before feeding them to the shingle machine



The final slicing of the blocks into shingles

How the shingles are made up in the familiar bundle

Resilience of Chinese Bark

THE American consulate general at Shanghai from time to time has received from firms in the United States small samples of a bark which originates in China, and which is said to possess certain rubber qualities of possible commercial importance. The bark has been identified with the assistance of Mr. Frank N. Meyer, agricultural explorer of the Bureau of Plant Industry, United States Department of Agriculture, who is now in China. Mr. Meyer in speaking of the bark states: It is "Tu Chung," also called "Shih Mien." The names mean, respectively, "ease of heart" and "stone cotton." The scientific name is *Eucommia ulmoldes*. In horticultural journals the name "hardy Chinese rubber tree" has been used, and it has been suggested that this tree should be cultivated for its caoutchouc contents. Preliminary experiments made in France, however, have shown the caoutchouc contents to be too small to compete with tropical trees and vines which produce the same article.

This tree is found cultivated around houses in Szechuan, Hupeh, So, Kansu, southwestern Shensi, and Chekiang, and the bark is used as a medicine for heart diseases. It is said that opium smokers especially are benefitted by its use. Wilson, in his book, "A Naturalist in Western China," states that this bark is also used as a diuretic, a tonic, and an aphrodisiac.

The Department of Agriculture has been distributing these last years several hundreds of small trees, and the plants seem to be hardy even in central Kansas. It is not particularly ornamental, presenting an appearance somewhat between that of an elm and of a mulberry.

In the Chinese Materia Medica, revised by Rev. G. A. Stuart, M.D., the following information is given under the heading of *Eucommia ulmoldes*.

Another name is "Mu Mein," which is the same as that of the cotton tree, *Bombox malabaricum*. This name refers to the fact that when the bark is broken and the fractured edges drawn asunder there appears a delicate, silvery, silky fiber which may be drawn out to the length of almost an inch without breaking.

The leaves of the tree are eaten when young, and the wood was formerly used to make patterns. The bark is the part used in medicine, and is met with in quilled or shriveled pieces of four to five inches in length. The flowers, fruit, and wood are astringent, and may be used in medicine. The action of the bark is considered to be tonic, arthritic, diuretic, and depurative, and is especially prescribed in difficulties of the liver, kidneys, puerperal diseases and excessive perspirations. The use of the young leaves (called "Mein-ya") as food is thought to promote the elimination of poisonous effluvia and to prevent hemorrhoids.

It will be seen that the bark is utilized in China for its supposed medicinal properties only. It does not appear in the customs returns as a separate item of export, and if there are any exports the quantity is negligible. Further, the sources of supply are in rather remote and for the most part inaccessible districts.

The Current Supplement

AS mechanical processes are improved and technical skill increases, new apparatus becomes available for scientific research, and in probably no direction has this been more apparent than in investigations of the effects of high pressures and temperatures on matter. An article on *Some High Pressure Phenomena*, in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2185, for November 17th, calls attention to some of the revolutionary results of modern research. *German Sources of Nitrate* reviews various processes by which the enemy is obtaining a very essential material. *A Garden Terrace Theater on a College Campus* describes and illustrates a decorative and useful structure at one of our western colleges. *Annatto of Commerce* describes a useful dyeing substance, and is accompanied by photographs. *Sands for Glass Making* discusses the necessary characteristics of such material, with especial reference to the manufacture of optical glass. *Safeguarding the People's Food* calls attention to some of the problems now engrossing public attention, and is accompanied by a series of interesting photographs. *A Motor Ambulance Driver's Notes from the Front* throws intensely interesting side lights on matters in France, and particularly the doings of some Americans in the French service. *The Occurrence in Virginia of Green-Gilled Oysters, similar to these of Marennes* treats of an interesting biological subject. *Skin Resistance of Ships* reviews our useful knowledge on an important problem of the day. It is illustrated by several diagrams. *Hardness and Hardening* deals with problems that constantly enter into manufacturing operations of every kind.

Fused Silica

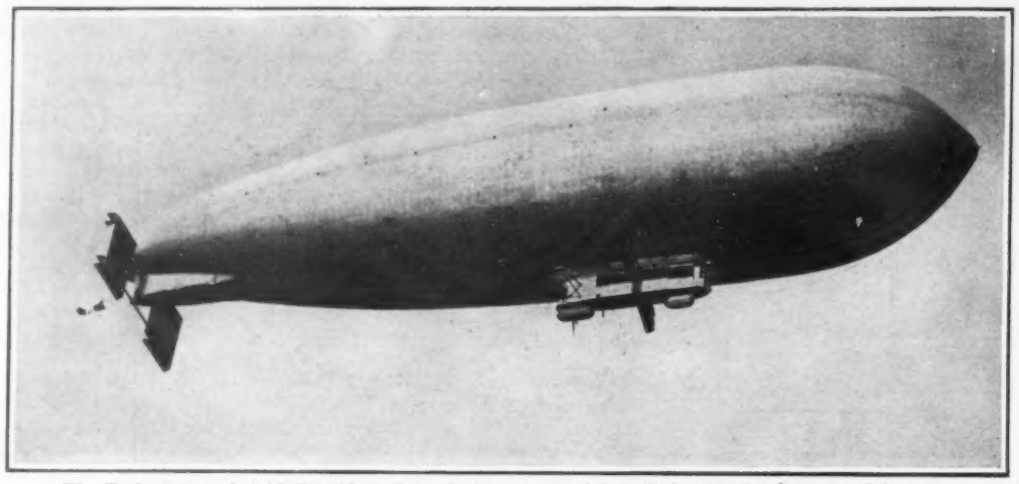
SOME interesting data on the development of the fused silica industry are to be found in a paper contributed by Dr. F. Bottomley to the Newcastle section of the Society of Chemical Industry. The first practical success was, he stated, obtained by Boys, who showed that very fine filaments of silica could be produced by shooting lumps off softened quartz by means of a crossbow. Silica tubing and other articles were made by Shenstone in 1901, his raw material being rock crystal, which was also used by Heraeus for similar purposes in 1903. The cost of this material was prohibitive, and led to attempts to replace it by fused sand. After success was obtained at Wallsend the process was infringed by the Deutsche Quartz Gesellschaft, who lost their case in the subsequent litigation. In the process used at Wallsend the furnace used is, Dr. Bottomley states, of the electric-resistance type, the heating cores being plates, tubes or rods of carbon or graphite. The limits of temperature between which the process can be worked are very close, since the silica will combine with the carbon to produce carborundum at a temperature little above that required for working the silica. In making tubes or pipes the starting-point is a hollow cylinder of plastic silica, which is formed round the core through which the current is passed. These cylinders can in the plastic state be drawn into tubing, and as much as 200 pounds weight of silica can be worked up at one time. The products of the Silica Syndicate are now used in substitution for stoneware previously imported from Germany.

What of the Dirigible Balloon?

New Possibilities of Lighter-Than-Air Craft Disclosed by the Recently Tested Forlanini Airship

EVER since its début, the aeroplane has occupied first place in the world of aviation. The dirigible, many years older than the aeroplane, then and there was side-tracked while the resources and skill and experience of leading aeronautical designers and constructors were concentrated on the newcomer. Naturally, the aeroplane has perforce made rapid progress; today there are thousands of aeroplanes coöperating with the armies in Europe.

To the lay mind the dirigible has come to be looked upon as a craft of secondary importance. It was good enough before the advent of the heavier-than-air type; but at present it is of little value. At least, so runs the popular opinion; whereas the truth of the matter is that much can be expected from the lighter-than-air type provided a small part of the attention which has been devoted to the aeroplane, is bestowed on the dirigible balloon.



The Forlanini semi-rigid dirigible balloon during recent trials in Italy, showing its general features

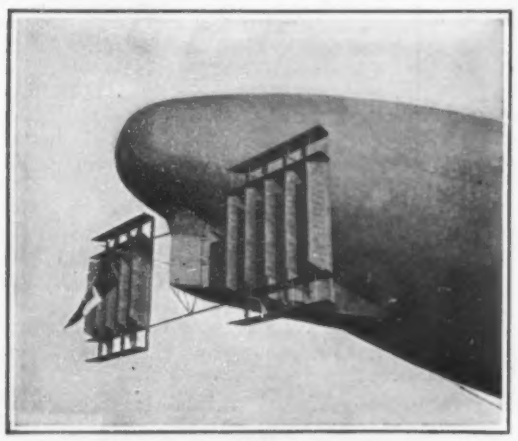
This leads up to the subject of the recently-tested Forlanini dirigible, which serves as an illustration of the wonderful possibilities of the lighter-than-air craft.

Through the courtesy of Engineer Luigi Crescentini, who has just arrived in America from Italy, we are able to learn something of the remarkable developments and achievements realized by the famous Italian aviation scientist, Enrico Forlanini, in the successful and record-breaking trips of his new type, semi-rigid dirigible airship. Mr. Crescentini has been closely connected with Mr. Forlanini for over 10 years, and has had the good fortune to collaborate and assist in the construction of all of the Forlanini airships during this period. The five distinct types of Forlanini airship have each, in their turn, been an improvement over preceding types; but the latest type is said to possess so many distinctly new features that it has placed the Forlanini design in a class of its own, and has broadened the field of dirigible balloons.

During the preliminary flights of this remarkable airship early in July, 1917, in the presence of the American Commission, it brought forth great praise and admiration from the members. The Americans who accepted Mr. Forlanini's invitation to make a flight, were particularly enthused with the performance of the airship.

On September 2d last, the same airship made a journey of eight hours' duration between two important Italian cities, at the rate of 50 miles an hour. Now this feat alone would be of some interest, but in no wise could it be regarded as a startling accomplishment. However, during the whole of this flight the airship maintained an elevation of 13,000 feet with such exactitude that the barograph record shows a practically straight line, notwithstanding the fluctuating weather conditions which were encountered.

Because of its general design, Forlanini's dirigible can rise to great heights in perfect safety. During the trials it ascended to an altitude of 17,500 feet, which constitutes a world's record for dirigible airships. This record is all the more appreciated when one remembers that the Zeppelin type only attains 12,000 feet, and this only after the crew has cast overboard every possible object which can be dispensed with. A typical case in point is that of a Zeppelin which, in order to escape hostile battleplanes, rose to a height of 12,000 feet; but to reach this altitude the crew threw out machine guns, instruments and every form of equipment. The Forlanini airship, on the other hand, is able to rise to great heights while still maintaining its fighting efficiency.



Tail end of the Forlanini dirigible, showing rudders and elevating planes

How important is the climbing efficiency of the Forlanini airship can best be judged by past performances. If Zeppelins could rise beyond 12,000 feet, they would be able readily to shake off a swarm of troublesome battleplanes, for the reason that beyond 10,000 feet the heavier-than-air craft can only climb at a greatly reduced rate. The climbing speed of 1,000 feet a minute can only be maintained up to about 10,000 feet by the best climbers, and above that altitude the rate drops rapidly. So it will be noted that with the Forlanini airship,

Engineer Crescentini and inventor Forlanini leaving the car of an earlier dirigible

climbing at the rate of 3,300 feet every four minutes up to high altitudes, a most effective means of escaping hostile battleplanes, is offered.

For bombing operations the Forlanini design is said to approach the ideal. It readily lends itself to the construction of huge aircraft; indeed, the one shown in the accompanying illustrations may well be looked upon as of moderate size, since it only measures 300 feet in length and 66 feet in extreme diameter. Even so, the present Forlanini airship can remain 40 hours in the air, covering in that period a distance of 2,000 miles. With a useful load of 6,000 pounds, it can rise to 13,000 feet during such a cruise; and the same craft, with less load, can rise to 20,000 feet. Because of its ability to rise quickly, it should prove almost immune from the anti-aircraft defenses of enemy cities and works being raided.

A detailed description of the Forlanini airship cannot be given at the present moment for obvious reasons. But the following facts, which Mr. Crescentini has set forth, are of sufficient scope to indicate the novel features of the Italian dirigible.

To begin with, the Forlanini airship has a double envelope: an inner or gas envelope and an outer one that completely surrounds the former. A continuous and entirely free air space is left between the two envelopes. The gas envelope is fitted with transverse and longitudinal diaphragms. A rigid truss girder runs from the bow to the stern, thus stiffening the entire structure. The girder is axially suspended from the gas envelope. The car or nacelle is arranged close to the envelope and is rigidly suspended from the truss. For steering purposes flexible surfaces of grate-like construction are used. The propelling apparatus is split up into independent sets. The screw propellers are arranged for adjustable and reversible pitch, which enables the airship to reverse on its course. An upper platform is provided on top of the gas bag, and is connected to the car by means of a ladder passing through a well. These improvements serve efficiently to lower the resistance to flight, to maintain stability during the descent from high altitudes, and to maintain the regular external form of the dirigible.

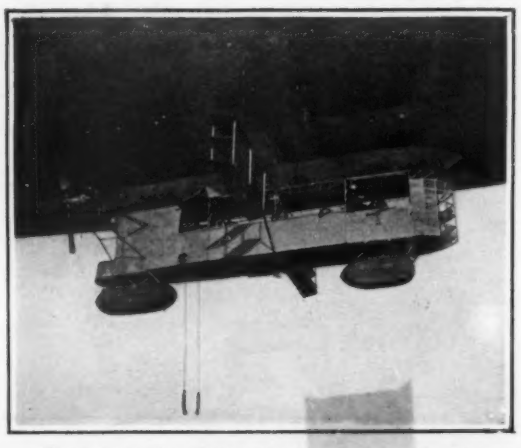
It is most unfortunate that the dirigible, as a class, is misunderstood by the general public and even by military and naval men. It is a target for never-ending criticism. Every time a German Zeppelin comes to grief after an encounter with battleplanes or with anti-aircraft batteries, the incident is hailed as another irrefutable proof of the failure of the lighter-than-air type.

Yet the fault is not with the craft. The fact is that the dirigible has been wrongly employed, just as would a fast scout-cruiser, lightly armored and carrying only a comparatively feeble armament, be wrongly employed if it were to engage a dreadnought. For the dirigible, as it is at present developed, with one or two exceptions, is nothing more than a scout craft or a weight carrier. As such it cannot hope to win a battle against powerful battleplanes and massed anti-aircraft batteries. Under favorable circumstances the usual dirigible can undertake bombing operations; but sagacious precaution dictates that it should be convoyed by battleplanes to repel hostile battleplane attacks, just as troop transports must be protected against submarines and torpedo-boat destroyers by a cordon of small, swift craft.

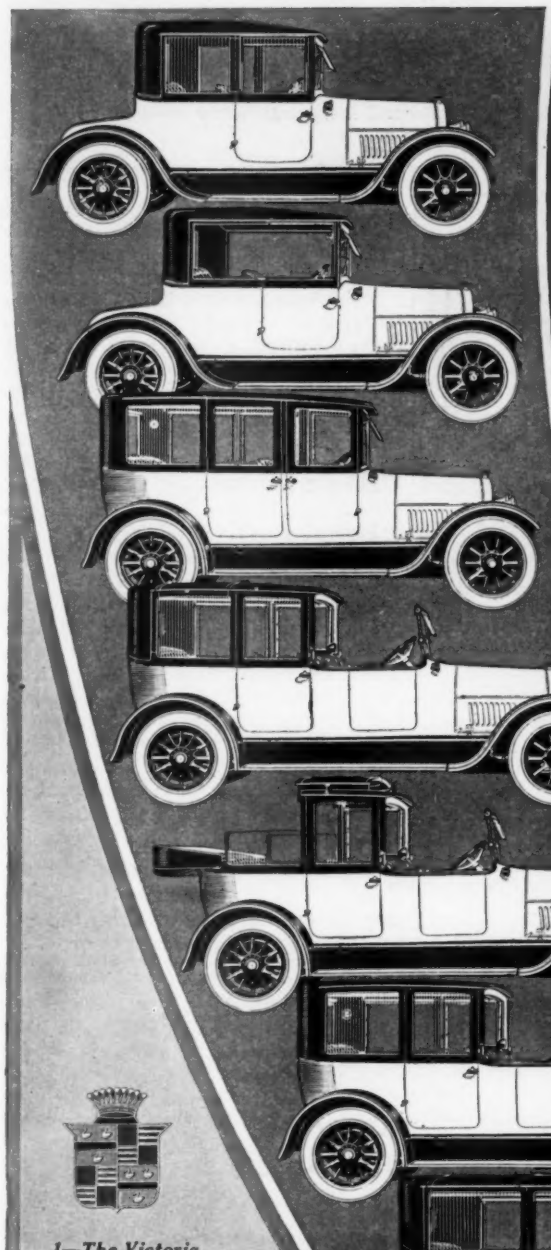
Bombing is not the ultimate objective of the German Zeppelin fleet, popular belief to the contrary notwithstanding. Evidences are plentiful that the Germans long ago learned the futility of employing their huge airships for scattering destruction in enemy countries, and that more and more they are employing the Zeppelins for scout work over the North Sea. The German fleets are guided by Zeppelin observers who, from their lofty perch, have a vast range of vision—50 miles and more, as compared to 15 or 20 miles from the lookout of the Allied fighting ships. Thus they are able to evade meeting superior enemy units, and to steam out to meet weak enemy units when they so choose. They can accept or reject combat, which is a tremendous advantage. And who knows but that most of the blockade runners and German raiders have been safely guided through the British cordon by Zeppelin scouts? Germany has ample Zeppelins still at her disposal to maintain a constant air patrol over the North and Baltic Seas. So, after all, the bombing of British towns is not the main object or *raison d'être* of the Zeppelin fleet. Before criticising Zeppelin failures one would do well to bear these facts in mind.

What the Germans have done and continue to do, the Allies can also do and do much better, especially now that the usefulness of the dirigible is materially extended and the most objectionable features are apparently missing in the Forlanini type.

In times of peace the lighter-than-air craft is going to come into its own as a rapid and safe means of travel, when the dirigibles now in use and under construction for military purposes, are slightly modified to carry 50, 100 or even 200 passengers.



Car or nacelle of the airship, which carries the crew and the engines



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A four-passenger convertible, open or closed, car for the small family, for the business and professional man, a car in fact which adapts itself to an unusually wide range of utility.

2—The Victoria (*open*)

3—The Brougham
A handsome five-passenger four door family car in which all occupy the one compartment. Emergency seats provide for two additional passengers.

4—The Town Landaulet (*closed*)
A stylish city car of exclusive design providing, with the two auxiliary seats, for four persons in the passenger compartment. The rear section may be laid back, affording the advantages of the open car.

5—The Town Landaulet (*open*)

6—The Town Limousine. A car following the lines of the Town Landaulet, but in which the rear section is stationary.

7—The Landaulet (*closed*). A seven-passenger car whose ownership carries with it a sense of exclusiveness. It combines the advantages of both closed and open types.

8—The Landaulet (*open*)

9—The Limousine. A dignified and impressive seven-passenger car; a rare combination of comfort and protection, stateliness of bearing, and elegance throughout.

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The Motor-Driven Commercial Vehicle

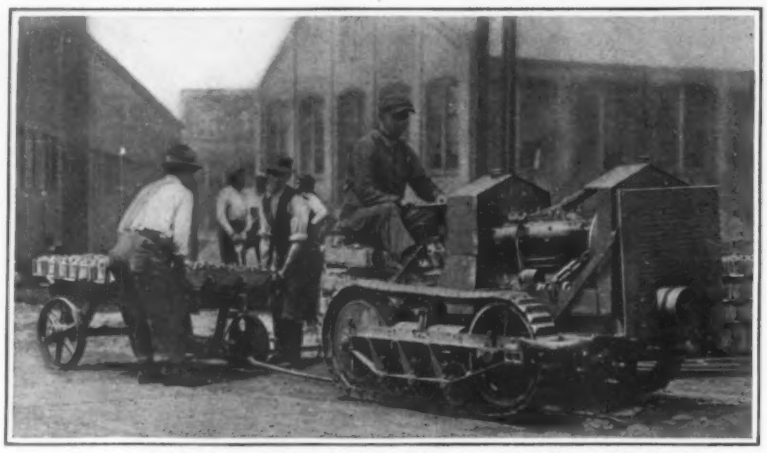
Conducted by VICTOR W. PAGÉ, M.S.A.E.

This department is devoted to the interests of present and prospective owners of motor trucks and delivery wagons. The editor will endeavor to answer any question relating to mechanical features, operation and management of commercial motor vehicles

The Small Industrial Crawler

THE crawler tractor was in the first place developed as an agricultural implement, then borrowed for use as a war machine. It is not quite so obvious that it is suited to industrial work, yet as a fact its scope for usefulness in this direction is perhaps even wider than on the farm. The very features which are so advantageous to the farmer make also a strong appeal to the business man who requires an easily applied and easily moved source of power.

We illustrate herewith a small crawler tractor designed to supply the motive power for a factory train. Its ability to haul heavy loads at good speed, and the fact that it requires neither road nor track, greatly simplify the movement of materials from one department to another. In the same way it is of value in the shipping room to speed up loading and unloading. On the whole, it seems that the small industrial crawler has come to stay.



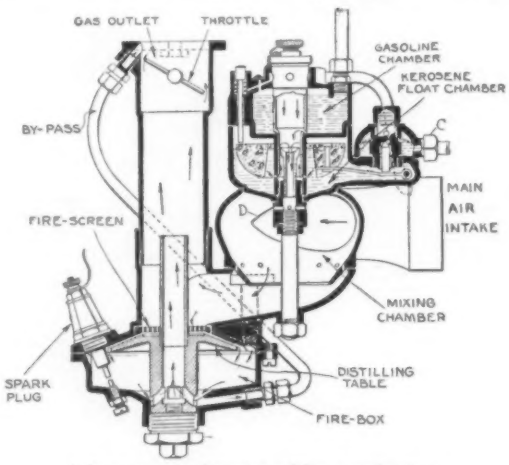
The mechanical crawler has its industrial uses as well as agricultural

Carburetor with Spark Plug; a New Development for Vaporizing Kerosene

MENTION has previously been made in these columns of the kerosene carburetors which operate on a partial combustion principle in which a portion of the liquid was burned to make a gas of the remainder of the vapor passing through the mixing chamber. In view of the interest prevailing at the present time in the action of various devices intended to burn kerosene, and inasmuch as there is apt to be shortage of gasoline as the result of the abnormal demands of war time conditions, particular interest is evidenced now in various types of kerosene vaporizers. In the form illustrated in the accompanying diagram, it will be evident that heating the mixture and securing heat to vaporize the heavy fuel is obtained by utilizing a portion of the carburetor as a fire box and putting a spark plug in this portion in order to secure the kindling of the gas when it is desired to start the engine after it has been standing for a time. This does not correspond to or is it a part of the mixing chamber, but is located below it, so that the heated air and mixture from the preheating chamber rises through a stand pipe to go directly past the throttle. Since the heat is provided in the carburetor itself, there is no need of a hot-air pipe from the exhaust manifold, nor is it necessary to jacket the carburetor. Gasoline is used for securing an easy start and priming so there is incorporated with the carburetor a gasoline supply reservoir above the float chamber through which the kerosene passes, so that the gasoline can be allowed to drip into the mixing chamber for starting purposes. The novel feature of using a spark plug in the carburetor is not a radically new one, inasmuch as it is covered by an English patent issued several years ago. A special form of spark plug is used, having but one electrode, this registering with a corresponding electrode screwed into the fire box body.

The fire box J is located at the bottom of the carburetor and contains an umbrella-shaped metal piece, K, known as the distilling table. The spark plug is connected in series with one of the plugs of the engine, so that with the four-cylinder engine there would be a spark plug in the fire box for every fourth spark in the engine. The fuel supply is directed to the float chamber in the conventional manner, the level therein being regulated by the usual float control mechanism. The gasoline supply is carried in a separate chamber above the float chamber. This chamber is filled through the action of a priming lever as the contents flow through the nozzle and into the air current by gravity. The current passes through the float chamber down through the nozzle and from there through four openings in the mixing chamber D, at the bottom, so that the fuel falls to the bottom opening into the curved surface R and falls from there to a baffle plate or supply screen H. Here it falls through the openings of a screen and drops to the top of the distilling table K and begins to float down the inclined surface of this table into the fire box, where it is ignited by the spark gap.

Only partial combustion occurs owing to there being an excess of fuel present and the resulting gas is drawn up through the fire box, through a vertical passage, back into the main stream of air from the mixing chamber and by the throttle which controls the amount of gas admitted to the engine. It is claimed that after three seconds running the fire box is well heated and that in six to eight seconds the intake manifold is sufficiently warm to maintain uniformity of mixture to the cylinders. The device is so well heated that kerosene can be used in cold weather as easily as under more favorable operating conditions. All of the air flows into the one opening at the side of



A kerosene carburetor with a spark plug

the mixing chamber, this opening being so formed that a downward whirl or eddy is imparted to the air, which carries the kerosene from the spraying nozzle. Once through the bottom of chamber C this air laden with kerosene vapor and globules of liquid, divides, part of it going directly above the stand pipe and part going down into the fire box, the amount going into the fire box being a relatively small portion of the total. The air entering the fire box through E is relatively free of fuel, so it picks up the kerosene dripping from the distilling plate. The lighter kerosene particles are carried direct as indicated by the arrows, while the heavier fuel particles go into the fire box, and are gasified before passing to the engine. It is claimed that the temperature can be regulated by raising or lowering the distilling table for which an adjustment is provided, so that its relation to the fire screen may be varied. On checking the draft on the fuel and air the temperature will be reduced by allowing greater draft, the combustion will be more energetic and the temperature will be higher.

When first starting this carburetor all of the fuel passes through the fire box and as soon as the distilling table temperature increases the more volatile elements are distilled from the fuel and the vapor thus produced results in a resistance to the flow of other than the heaviest bodies through the holes in the fire screen and this produces an increase of temperature in the member. As soon as pipe G is also heated to a point where all the lighter particles of fuel are well vaporized the heavy residue flows into the fire box to be partially burned. Great flexibility is claimed for an engine equipped with this carburetor, as it is believed by its makers that the use of a fi ed gas is of more value than the ordinary system of attempting to vaporize a mixture with heavy liquid particles in it by the ordinary hot plate or heated jacket manifold construction.

A Pump-Driven Lung for Cleaning the Sewer Basin

A NEW method for cleaning out sewer basins is being used with success in New York. The original scheme, as old as the sewer itself, of having a man ladle out the muck with a long-handled bucket is no more out of date, in comparison with the new apparatus, than are the various grab bucket devices of a more or less mechanical nature. At no stage is the sewer sludge exposed to the eyes or the nostrils of the operators or the public at large; and efficient cleaning of the basin is promoted.

The new basin cleaner is really a mechanical adaptation of the human lung. A motor truck is equipped with a body in the form of a large, rectangular, waterproof tank. There is an elbow-pipe for intake, operated by a pump, and a flexible discharge pipe. The interior of the tank is so arranged that the fluid from the intake pipe is driven, at full pressure of the pump, through a series of baffle plates and screens, finally passing to the discharge pipe.

In operation the truck is brought to a halt beside the open manhole, and both pipes run down into the basin, the intake pipe, of course, being brought into actual contact with the sludge deposit. The tank is nearly filled with water from the nearest hydrant, and circulation is then started by opening the discharge valve and throwing the pump into clutch with the engine of the truck. The sludge-laden fluid from the sewer passes up the intake pipe, through the baffle plates and the screens, where the sludge is removed and thrown down to the floor of the tank, and finally completes its circulation by returning to the basin through the discharge pipe to get a fresh load of sludge. Operation continues until all the sludge has been thus transferred from the bottom of the sewer basin to the bottom of the tank. As the solid matter displaces the water in the body of the truck, the surplus water runs off into the sewer through a special outlet valve. The pump is kept running at constant pressure by regulating the engine speed.

Cleaning the sewer catch-basin by means of a circulatory system much like that of the human being

Smokeless Fuel from Wood Waste

A process for making smokeless fuel from wood waste is in course of development at Nanaimo, British Columbia, according to a report from American consul R. B. Mosher, stationed at Victoria, B. C. It is estimated that 15,000 cords of wood waste are now destroyed daily in the province. By the new process this material would make 10,000 tons of smokeless fuel. It is said that this fuel can be produced at the factory for $2.50 a ton. The fuel is made by a progressive distillation process, carried on entirely by means of heated and cold gas, and no foreign substance enters into it.

Ships of Stone

(*Concluded from page 361*)

two separated walls of metal lath. The outer surface of the Fougener hulls is finished by hand, and this makes it possible to obtain a very smooth skin. As a result friction is surprisingly low; and in the case of the barges built, the boats have been found easy to tow. It is quite likely that the cement gun will be employed hereafter for laying on the bulk of the surface coatings of concrete, and only the smoothing up will be left to hand work. It has been found advantageous to resort to waterproofing, especially where the vessels are exposed to frost.

Waterproofing is effected by adding a colloidal material to the concrete at the time of mixing. As the water works out of the mass it leaves behind in each pore a deposit of colloid, and this afterwards, if reached by moisture, swells and thus plugs the passage which otherwise would admit water. The process is said to be thoroughy satisfactory. Undoubtedly this protective agency will contribute to a marked extent to the durability of the concrete fabric.

By way of contrast, it is interesting to examine the pictures of concrete ship construction as practiced under the more familiar mold system. The two views of this which accompany the present discussion are of a vessel which will be launched some time in March at San Francisco. Its cost is estimated at $750,000, against $2,000,000 for the ordinary steel ship of the same size.

The "Trading with the Enemy Act"

(*Concluded from page 363*)

height, closed with a glass stopper and having the seal of the applicant, and bearing an exact description of the contents.

"For coloring matter prepared from tar, a sample of dyeing on wool, silk, or cotton must be transmitted. These samples should be attached in a suitable way on a sheet of cardboard measuring 330 millimeters by 210 millimeters (13 by 8¼ inches). For each coloring matter, samples of dyeing in three different shades must be filed; for coloring matter permitting of quantitative analysis, one of those samples should be dyed with one per cent, and the other two samples might be weaker or stronger, according to the power of the dyeing matter. These samples must be accompanied by a description of the method of dyeing, distinctly giving the degree of concnetration of the dye liquor, the mordant, if any has been used, the temperature, etc., stating also whether the dye liquor has lost its color, or still contains more or less dye matter. Directions concerning the method of dyeing *will not be published in the patent, except upon the special request of the applicant.*"

Thus while the German Government requires a complete disclosure of the "technique" of a process before granting a patent, it does *not* give out this disclosure to the general public. This increases the problem that faces us at the present time. The "Trading with the Enemy Act" enables our manufacturers to make use of German patents, and there are about 20,000 patents affected by the Act. But we find that many of these patents are not complete disclosures. Before our manufacturers can use them commercially much time and capital must be expended in experiment. This would deter our manufacturers from applying for licenses were they not assured that they would be permitted to continue to use the inventions after the war. The statute provides that unless the license is limited in term it shall extend for the duration of the patent.

It will be evident thus, that this statute is not an act of confiscation except in so far as the enemy inventor will be obliged to permit the use of his patent even after the war, but will receive royalty for such use. We do not know what Germany is doing with American patents. Certainly Germany is not confronted with the same difficulties that we are. American patents in Germany have to do mainly with machinery and have no bearing on the health or safety of the nation. On the other hand, there are German patents in

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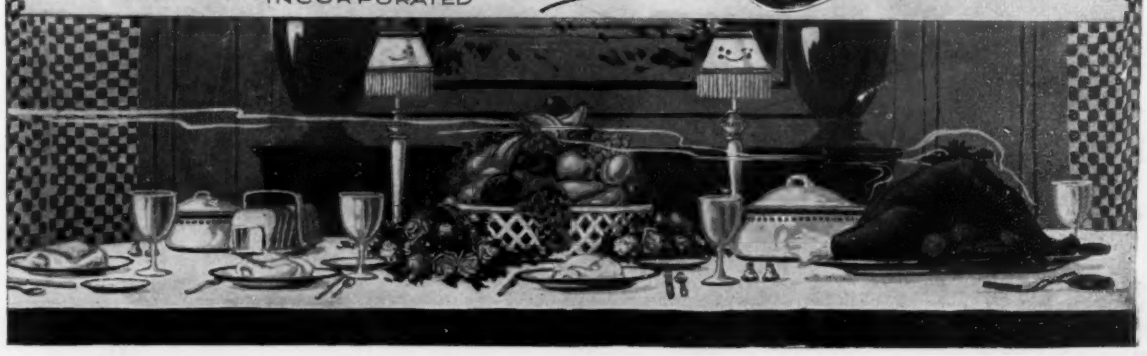

Importance of "Arch Design" in Furnace Construction

In the construction of furnaces for the heat treatment of metals, the laws of heat must be respected in order that the radiant heat can be completely used.

Figure 1, a diagram of the arch of Tate-Jones Furnaces (Series A and H), shows that all the radiant heat rays reached the hearth because of its properly shaped reflecting surface of the arch combined with properly designed flue area. Similar rays would be reflected from the opposite side of the furnace. All of this heat reaches the hearth and all of the hearth is heated. The work wherever placed on the hearth, receives full benefit of the heat. All of the available radiant heat is used.

Figure 2 shows improperly designed flues and arch. The arch reflects the rays not only on the hearth, but beyond it. Thus the work does not receive full benefit of the radiant heat.

Figure 3 shows that the hearth does not receive the full benefit of the reflected heat as the greater portion of the heat is reflected directly back upon its original source and therefore lost. This results in a great waste of gas.

All of the illustrations are of actual furnaces and have been scientifically tested. *Full information concerning the series A and H furnaces—for the hardening, annealing and heat treating of small tools, dies, parts, etc.—sent upon request.*

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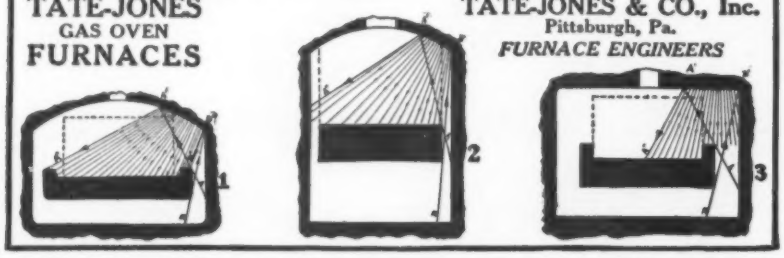
FURNACES



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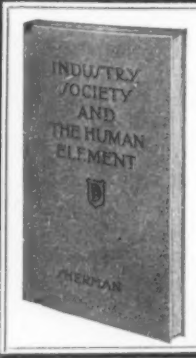

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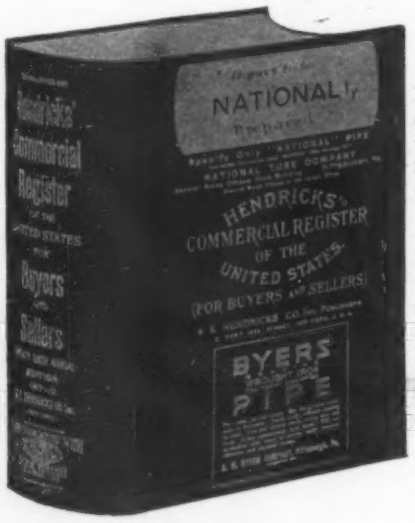

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CONTENTS

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this country on salvarsan, veronal, novocaine, etc., which are important medicines. We must permit operation under these patents because they are necessary to the health of the people. If Germany should look upon the "Trading with the Enemy Act" as one of confiscation and attempt reprisal, we can do nothing until the end of the war when we shall demand adequate indemnities to settle for the losses of our own citizens.

Our Government is going to regulate the manufacture under the new Act, in the strictest possible way, requiring rigid inspection and submission of samples. It will, if necessary, even fix the prices, on articles necessary to the health of the military and naval forces as the successful prosecution of the war and require a reasonable price in all cases, because the purpose of this Act is not to enrich the manufacturer, but to benefit the public at large. In the matter of drugs, it is now proposed that the supervision and control of their manufacture be taken over by the United States Health Service so far as their inspection is required. No license will be permitted until the Board is assured that the manufacturer is capable of manufacturing the product in a satisfactory way, and at a price that will be fair to the public.

It will be noted that the Act also provides for the use of enemy trade-marks. Very evidently there are some trade-marks which are so closely tied up with a product as to become the necessary designation of it so that the licensee must necessarily, with his license to use the invention, obtain also the license to use the trade-mark. However, in most cases, a trade-mark is simply a means of identification distinguishing one man's manufacture from another, and it is hardly likely that the Commission will permit American manufacturers to masquerade under a name that has been built up by German manufacturers.

In the matter of coyprights, it is quite probable that licenses will be granted for the translation of many German books; but other uses of copyrights will hardly be encouraged as necessary to public welfare.

The "Trading with the Enemy Act" has been drawn up very carefully, after full consideration of the experiences of our Allies, particularly those of England, and we have been able to profit by her mistakes. Its purpose throughout has been to take care of the welfare of the nation in an emergency, without infringing the rights of enemy inventors any further than is absolutely necessary. Under its provisions important industrial developments may be expected. In the chemical field we shall be released from our former dependence upon Germany. It will stimulate invention and make for the progress of applied science.

A Metal of All Work

(Concluded from page 360)

to the order of prospective users, in sufficient number to show that it is what they claim for it; and then if the process of casting fails to give satisfactory results when it passes out of their hands into those of the user, they are in a position to secure attention for the claim that this is due to improper workmanship or unfamiliarity with the new alloy in the foundry.

Such a course is not strewn with roses, however. Naturally, when a manufacturer is approached with the statement that here is a wonderful new metal that will solve all his troubles, he is going to try it out with the worst of his troubles, not with the least of them. He is going to give the sponsors of the new metal the very worst casting he uses, the one above all others that his workmen have the greatest difficulty in producing satisfactorily; and if they want to clinch his order, they have got to "get away" with that casting. Hence, the pattern room and especially the core-makers' bench in the Newark factory are a veritable chamber of horrors of all that is frightful in the founder's line. Cores that look themselves like highly complicated castings, castings that it would seem no human designing ingenuity could contrive, are part of the day's work here. The way of the innovator is a rocky one.

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The Restaurant Prices Are Most Moderate

Marked Changes in Captive Lions

LIONS which have passed their lives in the shelter and confinement of a zoölogical park become radically different both in external appearance and in the shape of the skull, from their brothers roaming free in the wilds of Africa. The superintendent of the National Zoölogical Park, under the direction of the Smithsonian Institution, draws this conclusion after examining 59 specimens of *Felis leo massaica*, a subspecies of lion from East Africa, preserved in the National Museum, 54 of which had been wild-killed and five of which had died in cativity at the National Zoölogical Park after presentation by Mr. W. W. McMillan. These five park-reared animals had definite and complete records. They were captured near Nairobi, British East Africa, and comparisons of skins and skulls were made with specimens of equal age, killed in the same vicinity. All chance of error from the use of park animals of unknown origin, which might be crosses of different subspecies bred in captivity, or specimens of wild forms not represented in the Museum collections, is thus eliminated.

The most conspicuous external characteristics which distinguish the park-reared animals from the wild lions of the same age and from the same region are much darker color, more luxuriant mane, and much longer hair tufts on the back of elbows. When the McMillan lions appeared at the Park, their strange pale grayish buff coloration was remarked as particularly beautiful as the men at the Park had been accustomed to the much darker lions already in captivity. When, after the death of the animals, the skins reached the Museum, the great darkening of the general color since their arrival was at once noted. The degree of color change was in direct relation to the period of life in Washington. Two of the McMillan lions were males and three females, the females averaging somewhat darker in color than the males. The skin of one of the female lions which lived for five years in the Park, turned so dark that at a short distance it gave the appearance of a blackish-tawny animal. The manes and tufts of hair on the back of the elbows of all the captive lions were much longer, more silky, and more cinnamon buff in color than in wild-killed animals.

In view of the success of Mr. Beebe's experiments in increasing the pigmentation in birds by confinement in superhumid atmosphere, it would perhaps seem unnecessary to go beyond the theory that the humid climate of Washington acted in a similar manner on these lions from the highlands of East Africa greatly to darken the color of the skin.

In the skull, the changes wrought by captivity are even greater. The skulls of the captive lions are broader and shorter, more massive and bulky, and show many relative differences which in wild animals would be instantly accepted as sufficient evidence on which to base a new species. The obvious reason for these great differences is that the principal muscles operating the jaws and neck (those muscles used by a wild lion in mauling and killing game, biting, gripping, and shaking) have had little influence on the shape of the bones during development. In a wild-reared lion these powerful muscles naturally and in a normal way mold the growing skull, particularly in the regions of their attachment.

Cutting the Cost of Packing by Using Standardized Containers

THE general movement for economy in the shipping room by means of standardization of boxes has been given added impetus recently by the attention it has received from the manufacturers of women's hats. Prominent men in that industry are convinced that the elimination of irregular sizes of boxes would make possible a large aggregate saving for the producing plants of the entire country. One of the manufacturers states that the hat factories would save, the box makers would save, and there would be a saving of material which it is necessary to use for filling crevices in the boxes when they are not of standard size. The packing cost of trimmed-hat manufacturers is estimated at 2 per cent, and if 20 per cent of the packing cost can be saved by standardization, the reduction of expense represents a sum of money which warrants the attention that has been given to the subject.

Leaders in this movement among the hat manufacturers have suggested specific standard sizes for paper boxes and corrugated casings. Their adoption, it is stated, would enable the paper-box makers to regulate their production so that the expense for labor would be decidedly reduced. Larger quantities could be produced without altering the machines, a more rapid output could be expected, the working force could be cut down and more regularly employed, and the labor released would be available for other purposes. Box material would be saved, and larger quantities of boxes could be kept in stock with the certainty that there would be a future demand for them.

Opening for Chemical Fertilizer in Italy

SINCE the war, that is to say since the utilization of her rich and numerous pyrite and sulphur mines for the manufacture of explosives, Italy has taken up on an enormous scale the manufacture of sulfuric acid, nitric acid, nitrates and cyanamides. By working the beds of potassic salts in Eritrea, and those of phosphates in Tripolitania, she has also succeeded in obtaining phosphoric acid, nitrogen, potash and lime, which are the chief bases of chemical fertilizer. Although the apparatus now in use is capable of greatly increasing the output of sulfuric acid, etc., still it would be erroneous to assume that Italy is able to meet the whole of her agricultural requirements. As an instance of this we may mention the "nitrate famine," which in many cases has caused a stoppage of the rice growing industry. From the pre-war price of 35 lires per cwt., sulphate of ammonia has risen to 130 lires. Wine growers are also much alarmed at the dearth of sulphate of ammonia and calcio-cyanamide; carbon is also wanted and the soil is getting impoverished to such an extent that the National Agricultural Committee is calling the attention of the government to the seriousness of the situation. This state of affairs is not likely to improve in the near future. This is, therefore not only the moment to do a trade with Italy in nitrate fertilizers but also to secure permanently a good and growing market.

How a Little Thing Mounts Up

PERHAPS it has occurred to few people to speculate about the amount of leather used in the sweat bands of hats. The makers of one of the fabric substitutes for leather, however, have just completed a survey of this field. They report that in 1916—just an average year—there were 127,492,872 hats and caps made in the United States, or two and a half "lids" for each member of the male population, without regard for age, race, color, or previous condition of servitude.

The sweat bands for all these hats would make a single band about two inches wide and 265,625,000 feet long—enough to go twice around the world, with plenty left over for a nice sizeable bow somewhere along the equator. In this tape there would be 44,000,000 square feet of leather, and the loss in trimming off the corners of the hides and bringing them down to this shape would amount to at least 11,000,000 square feet more. Now 55,000,000 square feet of leather would make the tops for about 20,000,000 shoes. We need feel little wonder, then, in learning that next year a goodly part of this leather actually will go into shoes, that under the pressure of ever advancing prices the leather hat band is fast becoming a thing of the past, replaced by composition fabrics of one sort or another.

We have had substitutes and substitutes, but here is at least one substitute that stands more than an even chance of being permanent.

The HANDY TERMINAL

"Grips Like a Vise"

It eliminates all terminal troubles—A Cable Terminal and Spark Plug terminal all in one. No burned fingers—No lost nuts in drip pan—No loose connections.

Most ignition trouble can be traced directly to loose connections caused by vibration and jar. The Handy *can't* work loose—the greater the vibration the tighter the jaws of the Handy grip—the better the electrical contact.

The jaws of the Handy are threaded on the inside and engage the threads of the Spark Plug center bolt. One motion raises the ring, compresses the steel spring, releases the terminal and lifts it from the Spark Plug. There are no nuts to tighten or loosen or fish out of the drip pan. No tools are required. Can be attached or detached in *one second*.

The method of fastening the magneto cable insures a permanent connection. The ferrule is fitted to the cable and the stripped wire firmly held by a copper clip, making a non-soldered connection that can't work loose.

The Handy is the last word in convenience and efficiency. Made in three sizes to fit *every* make of Spark Plug, for pleasure cars, motor cycles, trucks, motor boats, air planes, etc. Sold everywhere. If your dealer can't supply you—sent prepaid on receipt of price.

Buy a set and enjoy the many advantages of these wonderful time and trouble savers.

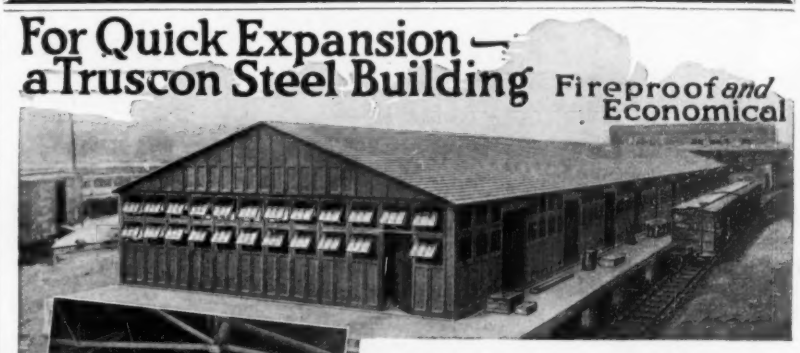
Dealers—Write for attractive proposition.

THE FRANCIS-RAND COMPANY

Manufacturers of

411 Erie Building — HANDY PRODUCTS — Cleveland, O., U. S. A.

For Quick Expansion — a Truscon Steel Building Fireproof *and* Economical



WHEN you need more room and *need* it *quickly*—when some department of your business becomes suddenly cramped for room, a Truscon Steel Building will permit *quick* and *economical expansion*.

The standard units of Truscon Steel Buildings are carried in warehouse stock, assuring immediate shipment and avoiding the delay of shop fabrication. Truscon Steel Buildings are speedily erected—easily enlarged—readily taken down and moved to a new location.

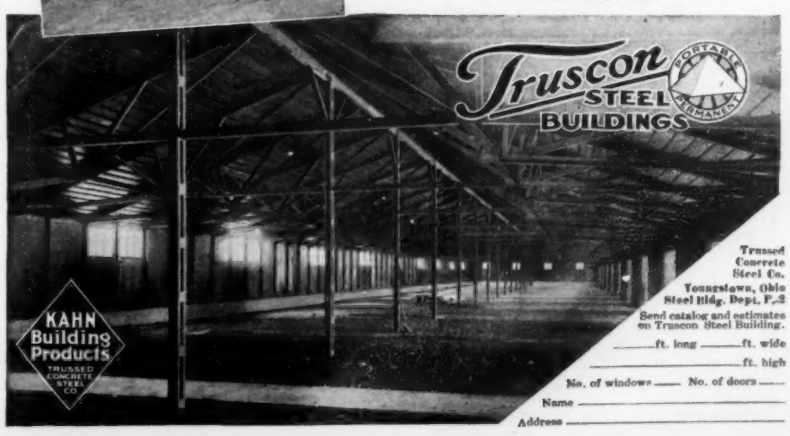
Truscon Steel Buildings come to you in steel panels, all ready to erect—made of interchangeable steel units, assembled by means of a simple locking device.

Fireproof, weathertight, strong and permanent. Every part of the building is steel,—walls, window-sash, doors and roof.

Supplied in all sizes, any length, widths to 60 feet, various heights, any desired arrangement of doors and windows. Used for machine shops, storehouses, offices, garages, hospitals, schools, restaurants, railroad sheds, etc.

Write or *send coupon today* for catalog and estimates. Address Steel Building Department.

Trussed Concrete Steel Co.
Youngstown, Ohio



Trussed Concrete Steel Co.
Youngstown, Ohio
Steel Bldg. Dept. F-2
Send catalog and estimates on Truscon Steel Building.
____ft. long ____ft. wide
____ft. high
No. of windows ____ No. of doors ____
Name ____
Address ____

Lupton Factory: Interior of building with Pond Truss roof, giving light and ventilation in all weathers.

Ozone and Sunlight PAY

Many factories today, though well lighted, are not equally well ventilated.

This photograph shows the Steel Sash Department of our own factory.

Its roof is a Pond Truss, both lighted and ventilated by unbroken lines of Pond Continuous Sash.

These lines of sash are hung from the top, instead of centre-pivoted, and have underlapping storm panels at the ends. Thus they are weatherproof when fully open. Air enters by the side wall ventilating sash and goes out by the roof.

The Pond Truss was first designed for foundries and forge shops, where rapid air renewal is essential. But its combination of all-weather ventilation and remarkable lighting has caused it to be adopted also in many machine shops, etc., where personal efficiency is important.

Our booklet, "Air, Light, and Efficiency," tells how a number of famous factories have secured unusual results by unusual sash arrangements.

Let us help with your lighting and ventilating problems

DAVID LUPTON'S SONS CO.
CLEARFIELD & WEIKEL STREETS
PHILADELPHIA, PA.

Makers of equipment for daylighting and natural ventilation

STEEL SASH — PARTITIONS — DOORS
LUPTON
"INVESTMENT VALUE"

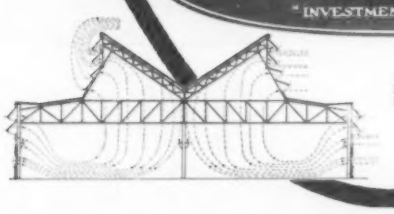


Diagram showing ventilation of typical Pond Truss Building in a cross wind.

Patents

WE take this opportunity to call attention to the fact that our comprehensive practice includes not only the securing of the registration of trade marks, but embraces as well the obtaining of Letters Patent in the United States, and all countries foreign thereto.

Numbered among our clients are some of the most successful inventors in the United States. Our endeavors are always directed to the securing of Letters Patent which will protect the inventions of our clients as broadly and adequately as possible. A copy of our Hand Book on Patents, in which this phase of our practice is fully discussed, will be mailed to any address, on application.

We shall be pleased to give our unbiased, free opinion as to the probable patentability of any invention, provided a sketch and a description disclosing the same are sent to us. A distinct advantage possessed by our clients is found in the notice which each patent taken out through our office receives in the *Scientific American*.

MUNN & CO.,

Solicitors of Patents and Trade Marks

WOOLWORTH BUILDING, 233 BROADWAY, NEW YORK
625 F ST., WASHINGTON, D. C.

FOREIGN COMMERCIAL NOTES AND QUERIES

The SCIENTIFIC AMERICAN has always enjoyed a wide international circulation. Its voice is heard in the remotest corners of the earth. Now that American manufacturers have been stirred to the advantages of international expansion we are anxious to do our part in bringing American products into foreign markets. Hence this department has been established to pave the way for American trade expansion to all quarters of the globe.

Those who are interested in the trade opportunities listed in this column, can obtain the names and addresses by complying with the following simple rules: 1. Write only one inquiry on a sheet. 2. Always give the serial number. 3. Write on your own business letterhead. The SCIENTIFIC AMERICAN assumes no responsibility for the financial standing of concerns or individuals. Address all communications to the Query Editor of the SCIENTIFIC AMERICAN, Woolworth Building, New York.

697.—A concern in Long Island is desirous of forming a connection with some firm in South Africa to handle aluminum solder that sticks.

698.—A man in Philadelphia who is shortly returning to England, would like to get in touch with American manufacturers who would like to be represented in England.

699.—An English advertising and proprietary article specialist seeks an Australian monopoly of any salable article. Would also like agency for a medium priced car.

700.—Young Toronto lawyer with good connection could devote portion of time representing reliable firm in Toronto, Canada and district. Good references.

701.—A correspondent in Edinburgh, Scotland, wishes catalogues and net prices of automatic orchestral band machines suitable for restaurants, etc., also any other amusement device.

702.—A company in Holland desires to secure agencies for the sale of mechanical appliances, especially engines or machine tools. The firm has a representative in New York. Reference.

703.—An agency is desired by a commission merchant in Spain for the sale of belting for machinery. Correspondence should be in Spanish or French. References.

704.—A man in Italy is in the market for hardware. Payment will be made by cash against shipping documents. He may consider an agency proposition. Correspondence should be in Italian. References.

705.—An exclusive agency is desired by a firm in Spain for the sale of kitchen utensils of aluminum and tin, the goods to be purchased outright. Quotations may be made f. o. b. New York. Payment will be made through banks if so required. Correspondence may be in English. References.

706.—A firm in Italy wishes to buy or secure an agency for the sale of automobile accessories of all kinds and electric lamps and apparatus in general. It will also consider both outright purchases and agencies. Correspondence should be in French or Italian. References.

707.—A firm in Italy wishes to purchase ribbon saws from 30 to 50 millimeters, and 0.8, 0.9, or 1.0 thick; circular saws; and machine tools of all kinds. Catalogues and samples should be submitted wherever possible. It will also consider an agency proposition, or both an agency and purchase. Correspondence should be in French or Italian. Reference.

708.—A foreign Government desires to purchase a chemical laboratory outfit to be used in connection with public instruction in chemistry or physics, and for analyzing food, drugs and other products. Quotations should be made f. o. b. New York or San Francisco. Goods should be very securely packed. Full information should be submitted. Correspondence should be in Spanish. Reference.

709.—A company in New Zealand desires to purchase hardware, such as locks, hinges, handles, screws, nails, hat and coat hooks, etc. Quotations should be made f. o. b. steamer New York. Payment will be arranged by the company's agents in New York. References.

710.—A firm in British East Africa is in the market for hand and power operated coffee pulping machines, coffee washing machines, and galvanized wire screening for making coffee drying screens, ⅛-inch mesh, 18 to 24 wire gauge, 36 inches wide, and put up in rolls of 60 feet. Payment will be made by sight draft with bill of lading attached. Prices should be quoted in English sterling. Goods should be packed in extra strong crates or cases with all bright metal parts carefully protected by waterproof wrappings. Correspondence may be in English. References.

711.—A company of film importers in British East Africa desires to buy second-hand moving-picture films, such as features of from 2,000 to 5,000 feet each, comedies, and short dramas of about 1,000 feet. Payment will be made by cash against documents in New York through export house, which will arrange credits. The films should be strongly packed with waterproof linings. Shipments should be made by parcel post or by express to London and then to East Africa. References.

712.—A contractor in New Zealand desires to buy molds for making concrete house blocks, draintiles, and roofing tiles. Catalogues, discount, price lists, etc., should be submitted. Payment will be made by cash with order.

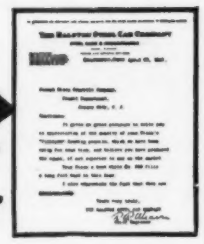
713.—A company in England is in the market for engineers' tools and machinery, lathes, drills, joiners' tools, edge tools, saws, etc.; galvanized baths, buckets and enameled domestic utensils; and kitchen, toilet, and table ware and utensils. Quotations should be made f. o. b. American port. Payment will be made by cash in the United States against documents. References.

714.—A firm in Spain wishes to purchase and secure an exclusive agency for the sale of chains for bicycles and automobiles. Quotations may be made f. o. b. New York. Payments will be guaranteed through banks, if so required. References.

715.—A firm in Argentina desires to represent American manufacturers and exporters of stump pullers.

716.—A company in Bolivia is in the market for complete machinery and equipment for the distillation of alcohol from beets, and for the manufacture of beet sugar. References.

717.—A civil engineer in the Netherlands wishes to be placed in communication with American manufacturers and exporters of machine tools, especially those used in rolling mills, engineering works, electrical installations and plants. Quotations should be made f. o. b. American ports. He offers bankers' confirmed credit to accompany orders and payment against shipping documents.



Another boost for

DIXON'S ELDORADO

"the master drawing pencil"

THE Ralston Steel Car Company has tried out many pencils. It ought to know a good one. Read what its chief engineer says about the Eldorado:

"It gives me great pleasure to write you in appreciation of the quality of your Dixon's "Eldorado" drawing pencils, and believe you have produced the equal, if not superior to any on the market.

Your Dixon's Best White No. 352 fills a long felt want in this line.

I also appreciate the fact that they are *American-made.*"

This is only one of many compliments constantly coming Eldorado-way. And no wonder —"the master drawing pencil" holds its point without frequent sharpening—it bears unusual pressure without breaking. 17 degrees, each true to grade. There's an Eldorado for every pencil purpose.

Send 16c in stamps for samples worth double the money.

JOSEPH DIXON CRUCIBLE CO.
Dept. 121-J, Jersey City, N. J.

DIXON'S BEST WHITE N°352 *writes white on blueprints*

The Wireless Pup

A Bull Dog that jumps out of his kennel when you call him

A Wonderful Scientific Novelty Operated at a Distance by Sound Waves

Made of Hard Wood in Mission Finish (kennel 7 inches high) and used as—
An attraction for Dens, Private Offices, Clubs, Reception Halls—An Unusual Gift.
A sensation for Dinner and House Parties.

"Scientific American" calls this the most unique toy of recent years.

If not carried at your regular Toy or Gift Shop send $5.00 and we will ship prepaid and safe delivery guaranteed anywhere in U. S.

RAGTIME RASTUS—An Automatic Dancing Doll for Talking Machines. Rastus does one hundred different steps to the music—clogs, shuffles, jigs, etc. MOST AMUSING NOVELTY YOU EVER SAW.

THE BOXING DARKIES—Put on a good lively tune and these little figures box away with wonderful accuracy and speed. Most realistic, create lots of fun. **Great Christmas Gifts.** Prompt shipment.

These toys fit all talking machines (except Edison). Put on or taken off in five seconds.

At Talking Machine or Toy Dealers or from us prepaid. Rastus (Item 100A) $1.00. Boxers (100B), $1.25. Combination Rastus and Boxers (100 A B), $1.50.

NOTE—Circular of toys in colors sent on receipt of 4 cents in stamps. We enclose one of these circulars free with each shipment of toys if requested.

National Toy Co., 269 Congress St., Boston, Mass.

Acceleration as a Leading Feature of the Electric Vehicle

THE rapid acceleration necessary in congested traffic is admirably accomplished by the electric vehicle. This is an important point to consider in the purchase of an automobile, especially for urban use: for acceleration is an extremely big factor in rapidly negotiating heavy traffic, according to A. Jackson Marshall, Secretary of the Electric Vehicle Section of the National Electric Light Association.

The uniform high rate of acceleration possessed by the electric vehicle is well illustrated by the successful electric taxicabs in Detroit, and there is probably no other service in which rapid acceleration is quite so necessary. In short, the greatest ease of travel is characteristic of these "electrics," as they are capable of speedy maneuvering through city traffic, with the elimination of all jerks and jolts, and the consequent strain on the mechanism which is accentuated in the more complicated automobiles, thus assuring a longer life than is common to the gasoline taxicab.

An Unusual Case of Cattle Poisoning From the Wild Black Cherry

SEVERAL years ago a portion of New England suffered greatly from extreme drought. For six weeks the temperature was high, and very little rain fell. Wells dried up, farmers were obliged to cart water long distances in order to save their crops, and cattle were forced to eat hay and meal instead of green grass because the latter could not be found except in the swampiest pastures.

After weeks of excessive dryness, during which the cattle had eaten no green food, some rain fell and very soon the grass responded and again became fresh and succulent. A certain farmer turned his cattle into a nearby pasture, where the animals rushed madly about devouring everything green that was in sight. In a short time he noticed that a number of his cows were staggering about, their eyes bulging, and frothing at the mouth. Although the cattle were immediately driven out of the field some of them died.

Suspecting that some poisonous weed was responsible for the damage, the owner sought information along this line. The person to whom he told the story visited the field expecting to find Loco-weed or some other of several plants well known to be harmful to cattle, and went over the ground carefully. Not one of the plants mentioned was to be seen. There were, however, nearly hidden in the grass, numerous seedlings of the wild black cherry (*Prunus serotina*).

Here was the explanation. For a long time it has been known that when a branch of the wild black cherry is broken from a tree and the leaves become partly dried, a chemical change takes place and prussic acid is formed.

Substitutes for Starch

SOME interesting data regarding starch substitutes have been published by Dr. R. Koenig, who has investigated several types. At the beginning of the war starch substitutes in Germany consisted chiefly of potato flour mixed with chalk ground as fine as possible. When potato flour was no longer available, mixtures of powdered gelatine, white glue, and fine white chalk were used. The chalk content increased very rapidly as gelatine advanced in price, in one instance jumping from 20 to 35 per cent in 14 days. Although these products, as long as the glue was not of a yellowish color, were fairly satisfactory, still their price has generally been much out of proportion to their acutal value.

Other preparations placed on the market consisted of crystallized bitter or "cat" salts, water and burnt magnesia. This latter was subsequently sold as a "fatless washing medium." To make it, 70 per cent bitter salt, 23 per cent water and 7 per cent burnt magnesia were used; the salt was dissolved in the water and the magnesia thoroughly stirred in till dissolved whereupon it was allowed to stand in moulds for some hours till it stiffened through the formation of oxysulphate.

Industrial America Approves Kissel's ALL-YEAR Cab

Without the ALL-YEAR Cab

PATENTS APPLIED FOR

With the ALL-YEAR Cab

Increases Driving Efficiency
Insures Economical Maintenance

HERE is complete protection for truck drivers in wet and stormy weather, increasing their efficiency by improving driving conditions. Motor truck buyers everywhere are now turning to Kissel Trucks with the ALL-YEAR *Cab,* that removes the necessity of lay-ups—keeps trucks in operation the year around regardless of weather—discourages speeding—diminishes possibilities of accidents and excessive wear and tear.

Its summer form provides drivers with a cool open housing. In winter the ALL-YEAR *Cab* is quickly changed into a warm, dry, closed cab—weather-proof, draught and leak-proof—by adding the winter attachments.

The ALL-YEAR Cab
is an exclusive Kissel feature found only in

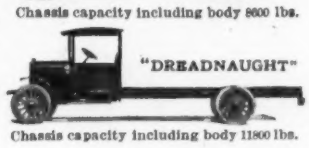
KISSEL TRUCKS

"THE FLYER"
Chassis capacity including body 2250 lbs.

Chassis capacity including body 3400 lbs.

Chassis capacity including body 5200 lbs.

Chassis capacity including body 8000 lbs.



Chassis capacity including body 11800 lbs.

A Truck for Every Purpose

IN no other line of trucks is found the Kissel combination of perfected wormdrive rear axles, superior front axles, scientifically constructed chassis and frame, the reliable Kissel-built Engine and double external brakes.

In the new line of Kissel Trucks, Kissel built-in quality is greater than ever, insuring unusual strength and power. See your Kissel dealer and investigate the five new Kissel Trucks and the ALL-YEAR Cab. Chassis prices $1185 to $3750. Send for specifications and literature.

Kissel Motor Car Campany
HARTFORD, WIS., U. S. A.

The Number Is Everything

Economy in cutting metal with hack saws is so important that nowadays every metal and every shape has its own best hack saws.

Even though every

Starrett Hack-Saw

is made of the best material—tungsten steel—and made right in every way, random selection will seldom if ever give best results. But Starrett Hack Saws can easily be chosen to do the best work, for page 208 of the Starrett Catalog No. 21B lists the uses of the various hack saws, and in this list will be found a saw best suited to every job. For this catalog, write to

STARRETT HACK SAWS CUT QUICKER LAST LONGER

The L. S. Starrett Co.
The World's Greatest Toolmakers
ATHOL, MASS.

42-746

Pipe Smokers

Your cigarette

LUCKY STRIKE

the real Burley cigarette

It's toasted

Burley is "blame good" tobacco

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© Guaranteed by The American Tobacco Co.

NEW BOOKS, ETC.

CRUMPS. The Plain Story of a Canadian who went 1917. By Louis Keene, of the Canadian Expeditionary Force; with a prefatory note by General Leonard Wood. Illustrated by the Author. Pages, 156. Price, $1.25. Houghton Mifflin Co. The Riverside Press, Cambridge.

Many are the books on the war, which consist, from first to last, of the personal experiences of soldiers at the front, told by themselves. Captain Keene has written such a book and it is one of the best among them. In the summer of 1914, Keene, who was an artist by profession was sketching in the Laurentian Mountains, Quebec, when his newspaper wired him to come to Montreal and do war sketches. When war came he enlisted, and was sent to the great training camp at Valcartier, Quebec. Here the author joined the First Auto Machine Gun Brigade, and a few weeks later he was aboard that first great transport fleet of thirty transports which carried Canada's first noble contribution of 35,000 men to Europe.

The story of Captain Keene's experiences is told in a chatty and most readable way, with touches of humor and anecdote which bring one into very intimate touch with the stirring events of these early days of the war. The test is largely in the form of letters home, and they convey just that kind of information which the average person who has, or expects to have, relatives and friends at the front, wishes to know.

Captain Keene has a touch of the dramatic in his style; the scenes, on the ship, in camp at Salisbury, England, or in Flanders (presumably Ypres) are very realistic, and the sketches are admirably done. One gathers from this book a sense of the amazing physical condition of the men; thus: "Always raining. Everything is wet, and I am sleeping in a rotten tent which leaks. Still, we are all so fit that what would kill an ordinary man doesn't worry us much." And the life leaves its mark on mind as well as body; thus we read: "It is very strange the lightness with which serious things are taken by men here, and it took me some time to understand it. A young captain of the Royal Marine Artillery was telling me how one of his mortars and the crew were wiped out by a direct hit. He referred to it as though saying that he had just missed his train.

This book is a decided addition to the useful literature of the war.

HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES. New York: S. E. Hendricks' Co., 1917. 4to.; 2,227 pp. Price, $10.

It would be hard indeed to lay too great a stress on the value of this massive collection of industrial and mercantile information, or on the sterling service it renders to the business world. The amplitude of its offering leaves little to be desired, and anyone interested, either as buyer or seller, in any kind of building construction and equipment or in railroad, mining, or engineering materials, will find that this widely-used directory gives ready access to the sources of supply and demand. It furnishes three very complete, correlative lists, one of trades classified, another of trade names, brands, etc., and a third containing the names of all firms and individuals appearing in the classified trades section, arranged alphabetically, with particulars of their chief activities and other specific and helpful items of information not generally found in less comprehensive publications, yet necessary to the expeditious and economical procuring of supplies. The method used in obtaining these details is the only one that ensures fullness and accuracy in compilations of this kind; that is, direct appeal to the firms listed, and the brief embodiment of the data thus acquired under the proper classification, thus making the whole work authoritative. Two indexes, one to classifications, the other to advertisers, greatly facilitate reference. The third section of the volume constitutes a new feature that offers such appreciable advantages that it will doubtless be retained in future editions. The trades and professions to which the register especially caters must accord it a grateful reception; indeed, there are few branches of industrial activity that would not be materially advantaged by its constant use in their purchasing and selling departments.

PELOUBET'S SELECT NOTES ON THE INTERNATIONAL SUNDAY SCHOOL LESSONS. 1918. By Rev. F. N. Peloubet, D.D. and Amos R. Wells, Litt.D., LL.D. Boston: W. A. Wilde Company. 8vo., 372 pp., illustrated. Price, $1.25 net.

In the 44th annual volume of these widely-used Notes we find the usual lesson discussions, chronologies, and aids to teaching, with maps, large colored plates, and numerous illustrations in the text. The aim of the guide is to make the lessons distinct, vivid and emphatic, and any teacher using the International Lessons must admit that this object has been completely attained.

A DIRECTORY OF MAILING LISTS. Compiled by William S. Thompson. New York: G. P. Putnam's Sons, 1917. 8vo.; 323 pp. Price, $2.50 net.

To the advertiser and the mail order merchant, mailing lists are of prime importance, taking rank with the quality of the goods sold and the printed matter used in selling them. This directory provides an economical way of finding such lists, by cataloging books and pamphlets in the alphabetical order of the trades and professions with which they concern themselves; this constitutes the first section of the directory; the second includes an index to Part I by means of which any source of information is quickly laid open to the reader.

THE SECRET OF TYPEWRITING SPEED. By Margaret B. Owen. Chicago: Forbes & Company, 1917. 8vo.; 159 pp.; illustrated. Price, $1 net.

Miss Owen, thrice world's champion, is so chattily optimistic, her faith in the student's ability to conquer difficulties is so strong, that confidence and the right mental attitude is at once induced. She begins at the very beginning, describes the right position at the machine and the placing of the hands, and emphasizes the necessity of rhythm in finger-action. Her method differs in some respects from all others. She has a sly little fleer for the authors of works on speed typing who cannot attain 137 words per minute themselves, and she scorns the eraser. Her bright pages abound in practical exercises and suggestions, and there are supplementary chapters on secretarial work, office systems, and the care of the eyes.

WORKING COMPOSITION. By John B. Opdycke. New York: D. C. Heath & Co., 1917. 8vo.; 352 pp.; illustrated. Price, $1.28.

"Working Composition" strikes to the very root of the prevalent faults in youthful writing and speech, and injects the practical element into the acquirement of good expression. The author believes that there should be less instruction about how to say things, and much more about what to say; always he keeps in view the duties a boy or girl will be called upon to perform at their entrance upon commercial life. With excellent judgment he treats of work, of speech about work, of letters about work, and of directions about work. There are some novel exercises and applications directly aimed at producing logical thinking and quick response.

SECRETS OF BREAD MAKING. Economy and System in the Bakery. By Emil Braun. Published by the author, at Dayton, Ohio, 1917. 8vo.; 194 pp.; illustrated.

This manual gives the baker all necessary chemical knowledge in a nutshell, treats of yeast and fermentation, of flour and dough-making, and explains heat, combustion, fuel and ovens in their relation to the turning out of perfect bread; modern machinery and equipment is adequately presented, and forms for oven reports, mixing and dough room records and shop records are given. Many bakers are familiar with previous works on bread-making by the same author, and all, whether their business be large or small, will find in this latest volume a good exposition of efficiency, economy and system in the bakery, with many money-saving suggestions.

TRANSACTIONS OF THE AMERICAN CERAMIC SOCIETY. Vol. xix. Arthur S. Watts, Editor. Published for the Society at Columbus, Ohio, 1917. 8vo.; 707 pp.; illustrated. Price, $6.25.

The annual meeting of this thriving Society brought forth the usual informative papers and stimulating discussions. According to custom, these have been collected, printed, and published, and thus the trade and the interested public are enabled to profit by the ideas aired and developed. Among other subjects instructively and constructively handled are commercial silica bricks, tiles, clay storage, enamel surfaces, glass sands, magnesite deposits, refractory clays, decorative processes, and the measurement of temperature, plasticity, and time of set.

A TEXTBOOK IN THE PRINCIPLES OF SCIENCE TEACHING. By George Ransom Twiss, B.Sc., New York: The Macmillan Company, 1917. 8vo.; 513 pp. Price, $1.40.

This text, full of sound suggestion, is intended for students who are looking forward to teaching science; but the full-fleged teacher and even the college professor may benefit from its embodiment of long teaching experience. The arrangement and treatment is such that the work may be used either as a broad general course in fundamental principles or as a special course for the teaching of some particular science. Preliminary chapters deal with the meaning and genesis of science, with science and children, with viewpoint and methods for the teacher, and with functions and values, educational, disciplinary and cultural; the various sciences are then taken up one by one, with particular reference to fundamental principles, methods, and equipment.

THE ELEMENTS OF ELECTRICAL ENGINEERING. Vol. i. A Text-book for Colleges and Technical Schools. By William S. Franklin. New York: The Macmillan Comapny, 1917. 8vo.; 475 pp.; illustrated. Price, $4.50.

The first volume of this series reviews and surveys elementary and applied electricity and magnetism and presents direct-current machines and systems; it performs the same service in connection with the theory, machines and systems of alternating-current practice, placing the emphasis throughout on the simple physics of the subject and on operating engineering.

THE MARVELS OF GEOLOGY. By E. S. Grew, M.A. Philadelphia: J. B. Lippincott Company, 1918. 8vo.; 244 pp.; illustrated. Price, $1,25 net.

The contents of this attractive volume are drawn from the author's more elaborate work, "The Romance of Modern Geology," and they form a very good selective treatment of earth-building processes, the effects of weather on the earth's history, records left by rivers and the sea, life in other worlds, rocks, earthquakes, coal beds, and pre-historic animal life, the whole told in non-technical language. There are eight well-drawn and informative full-page plates, and a chart of the more recent world-shaking earthquakes.

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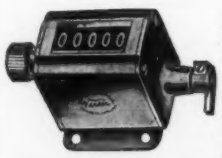

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THE SOLDIERS'S SERVICE DICTIONARY OF ENGLISH AND FRENCH TERMS. Edited by Frank H. Vizetelly, Litt. D., LL.D. New York: Funk & Wagnalls Company, 1917. 16mo.; 200 pp.; illustrated. Price, $1 net.

Dr. Vizetelly has made it possible for any man of the service to carry in his pocket no less than ten thousand English words and phrases applicable to military and conversational use, with the equivalent French form and pronunciation. Frequently, by looking up the significant word of an English phrase, one may find the equivalent of the whole phrase in French, without further search; for example, if one would ask, "What is the condition of the road?" it is necessary only to find the word "road," and under this is the whole phrase required—"*Comment est l'état de viabilité?*" with the pronunciation clearly indicated.

AN INQUIRY INTO THE PRINCIPLES OF TREATMENT OF BROKEN LIMBS. By William F. Fluhrer, M.D. New York: Rebman Company. 8vo.; 128 pp.; illustrated. Price, $3 net.

This "philosophico-surgical essay" by the consulting surgeon to Bellevue and Mount Sinai hospitals is a timely discussion anent the author's method for rapidly immobilizing broken bones by the use of perforated tin strips. There is a recognized difficulty in holding the fragments in the desired adjustment pending their fixation in permanent retention apparel, and in practical demonstrations this method has met with a gratifying degree of success. Without urging its general adoption, Dr. Fluhrer uses this and other former-day methods as embodying principles that might well be taken into account in the practice of today. Several of the plates are from old photographs, and confer a decided historic interest upon the work. A new design of crochet drill is offered, and there is a short consideration of bullet wounds of the brain and location of the missile by means of the probe.

SKETCH PORTRAITURE. By J. Spencer Adamson. London: Henry Greenwood & Co., Ltd., 1917. 12mo.; 27 pp.; illustrated. Price, 7d. net.

Individuality and a high degree of artistic effect mark the best examples of "sketch portraiture" in photography. In this concise pamphlet the author not only gives the necessary steps and processes for the production of this kind of work, but also reveals all the little niceties of manipulation and treatment that assure distinctive and satisfactory results.

A TEXT-BOOK ON COAL-MINING. For the Use of Colliery Managers and others. By Herbert W. Hughes. London, England: Charles Griffin & Company, Limited, 1917. 8vo.; 577 pp.; 4 plates; 690 figures. Price, 24s. net.

As our coal workings have to be carried to greater and greater depths, mining conditions become increasingly exacting. This well-known text book by a British expert was revised and partly re-written for its fifth edition; the present edition is a reprint of the fifth, which is now out of print. The work aims to give in one volume of moderate dimensions all the information necessary to the student and the practical miner; the details of general colliery work are minutely described, with an eye to those minor improvements that not infrequently turn loss into gain. Ways are suggested in which labor may be saved, and the valuable experiences of many districts are made accessible to the reader. There are chapters on the occurrence and composition of coal, and on prospecting; on breaking ground, sinking, preliminary operations, and methods of working; on haulage, winding, pumping, ventilation and lighting; and on surface works and the preparation of coal for the market; to each chapter is appended a bibliography, and the illustrations, many of them reduced from original working drawings, do useful service in conducing to a quick understanding of the text.

THE MINISTER'S SON. A Record of His Achievements. By Clarence Edward Noble Macartney. Philadelphia: Eakins, Palmer & Harrar, 1917. 12mo.; 28 pp. Price, 50 cents.

Dedicated to "Woodrow Wilson, son of a Presbyterial minister, spokesman for the soul of America," this argument for the general good character of the maligned minister's son is able and interesting. A long list of such sons who have attained honors in science, art, literature and philanthropy is given, with particular reference to the native American. The author's citation of the number of ministers' sons in "Who's Who" raises the question as to how far an inclusion in this useful handbook can be held as an indication of sterling character!

COMPRESSED AIR PRACTICE IN MINING. By David Penman, B.Sc. Philadelphia: J. B. Lippincott Company, 1917. 8vo.; 221 pp.; 113 illustrations.

A vast field of usefulness has been developed for compressed air in mining, and a good text-book on the subject is something that students and even practical men will welcome. The author of this volume, known both as expert manager and as teacher, states fundamental principles, compares air with other modes of transmitting power, and describes the various forms and makes of compressor. Coal-cutting by machinery instead of by the tedious process of hand-holing offers many advantages, and the author's comparison of electrical and compressed-air machines contains points of high importance to users of the latter type. The different forms of underground conveyors, rock-drills, and other appurtenances where compressed air plays a part, are clearly set before the student. The careful weighing of advantages and disadvantages is perhaps the strongest feature of the instruction.

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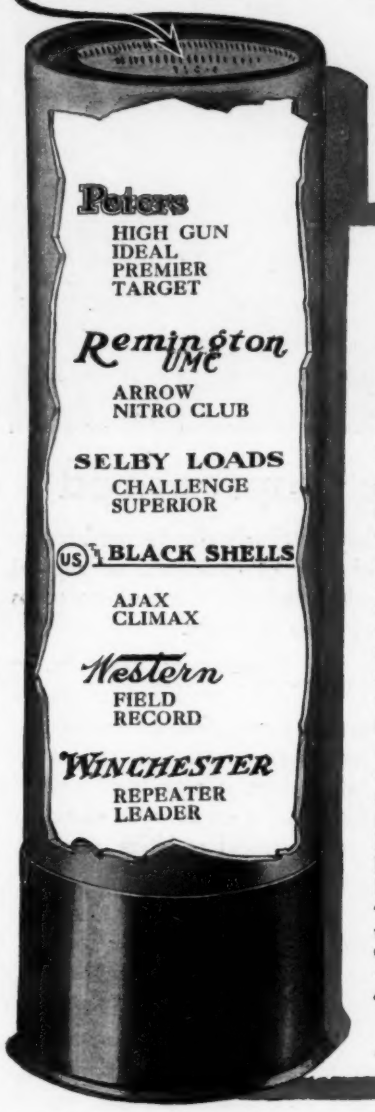

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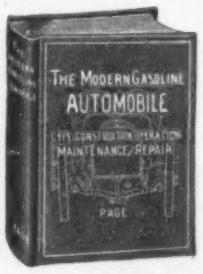

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(14259) E. W. J. says: It would be interesting to know more about the U-Boat than is generally published: 1. Their beam and length of 2,000 tons capacity 2. Their speed submerged. 3. Their speed on surface. 4. The kind of fuel they use. 5. The styles of storage battery. 6. Can they fire a torpedo effectively while submerged? 7. From what positions are the torpedoes launched or fired. 8. Can the torpedoes take other than an horizontal course? 9. Does destroying the periscope cause the loss of the boat? 10. To what depth can they safely submerge? 11. How deep is the English Channel between Dover and Calais? 12. How deep is the channel between Scotland and Norway? 13. How many miles wide is this channel? 14. Have the Allies located the probable route the German U-Boats take? 15. At what depth does a U-Boat become invisible from overhead observation? 16. Does the depth of water effect the distance of observation? 19. What is the speed of the larger U-Boats under water as compared with the smaller ones. 18. Have they yet in use a 5,000 ton U-Boat? A.1. We have never heard of a 2,000-ton submarine. The largest size we know of is about 800 tons. 2. Maximum submerged speed is from 10 to 12 knots. 3. Maximum surface speed is from 14 to 18 knots. 4. Liquid fuel, gasoline in this country and heavy oil in the German boats. 5. Very variable in this country and the type used in the German submarines is unknown to us. 6. Torpedo tubes are never above the surface of the water Depth of submergance has no effect on firing torpedoes except that the periscope at least must be above the surface to aim the shot. 7. See above. 8. Depth of submergance of torpedoes is governed by hydrostatic control so that a constant submergence is maintained. 9. Destroying the periscope does not seriously damage the boat. If not fitted with an extra periscope as is now the rule, it merely blinds the boat for work while submerged. 10. Specifications customarily require a trial submergance of 200 feet. 11, 12, 13. We regret to say that we have no charts at hand on the locality in question. 14. It is safe to say that the Allies have not determined the routes taken by the submarines to and from their bases. 15. The depth to which a submarine is visible depends entirely upon the height of the observer above the water and upon the condition of the atmosphere and the surface of the water. 16, 17, 18. See above.

(14260) J. J. R. asks: We have a twenty-five horse-power, four-cylinder gasolene engine direct connected to a generator. The normal speed at full load is 800. If we run this engine and generator at full load (25 H. P.) and normal speed (800 R. P. M.) and arrange a switch so that the load can be taken off instantly and at the same instant that the load is taken off the ignition on the gas engine is cut off, so that the application of power to the engine is cut off at the same instant as the load, will the speed of the engine increase or will it immediately start to decrease. A claims that it will immediately start to decrease and B claims that due to the stored energy it will immediately start to increase and run faster for a time and then decrease. A. It is our opinion if the power is cut off from your engine at the same instant as the load, the engine will at that instant begin to slow up, since you cannot cut off the frictional resistances. There is no stored energy in a machine which is using its full power to drive its full load. There is momentum of its moving parts but this cannot increase the speed. It could only maintain the speed if there was no resistance. The question has only a theoretical value, since it is almost an impossibility to cut off both load and power at the same instant. An instant is an exceedingly small interval, while both power and load act constantly at even smaller intervals, and friction has no interval. It acts incessantly. An increase of speed would indicate that the power was cut off an instant after the load.

(14261) J. D. McL. asks: Will you please inform me if electricity created by a dynamo or an electric current explode any kind explosives when coming in contact directly or indirectly, from wires charged, and what effect would a charged wire have on a body of water say about 20 feet wide and 100 feet long and 100 feet deep, would the electric current charge the whole body of water or a portion thereof. A. An electric current will not of itself set off an explosive when a wire which is carrying such a current comes in contact with the explosive. Heat, a spark or a shock, is required to set off an explosive. These may be produced by an electric current but the electricity will not directly cause the explosion. It is the indirect cause of the explosion. A wire even if carrying a heavy current would not charge a large body of water. The electricity would be diffused through the whole body of the water and dissipated into the earth. There would be but a slight effect upon any small portion of the water.

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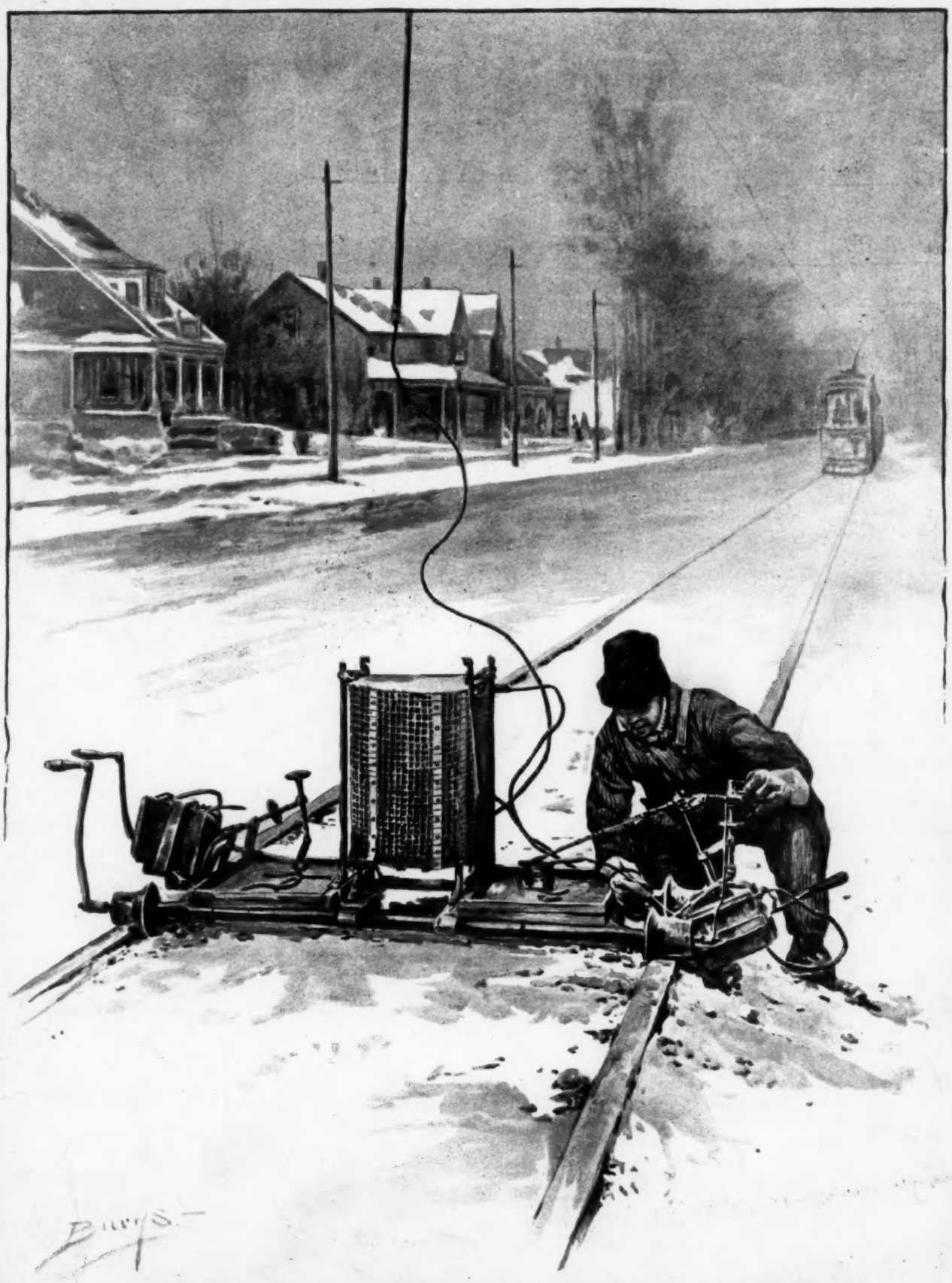

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